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ABSTRACT

A product of Project Measurement, this facilitator's manual is designed for an inservice course on the use of measurement in the instructional process for special educators of mentally handicapped students. Project Measurement had three goals: (1) to provide a better measurement system for special education teachers, (2) to encourage a team approach to data collection, and (3) to provide consistent follow-up for inservice participants. The first section of the manual discusses the philosophy of formative or process-based evaluation and how it differs from the permanent product assessment more typically used in special education assessment. The next section provides a philosophy of decision making that relies on the ABMC model where A stands for antecedent conditions and interventions; B represents the behaviors being measured; M stands for the measurement component; and C indicates consequation interventions designed to enhance or eliminate the behavior in question. The third section contains material on basic measurement components including pinpointing, recording, and charting with an emphasis on precision teaching resources. The last section discusses decision making guidelines that significantly enhance the utilization of data collected so that process information directs instructional decision making. The appendix includes a complete set of overhead masters (also included in each section). (DB)

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Measurement

Understanding Concepts Which Promote Student Growth In Learning

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1986

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MEASUREMENT: UNDERSTANDING CONCEPTS

WHICH PROMOTE STUDENT GROWTH IN LEARNING

Introduction

Not having enough time to do everything we want is a problem that everyone experiences. This is especially true in special education where organizational skills are a pre-requisite for success. Due to the number of students in special education instructional programs, it is important for special educators to use their instructional time effectively. Once students have been exposed to instructional techniques and strategies by the professional educators, it is vital that they have a measure to validate whether their efforts are helping students learn as effectively and efficiently as possible.

Project Measurement has three goals. First, to provide a better measurement system, which would help the special education teacher work with students with mental disabilities.

The Project illustrates how measurement can be an effective tool. We are not advocating a new approach. The Project provides a procedure for comprehensive follow through with measurement methodologies that have existed in Iowa for several years but have not been sufficiently promoted at the teacher training level or in the field of special education. Instruction in precise types of measurement have proven successful in some special and regular education programs. Where success has been attained, it has come as a result of training small numbers of teachers to implement the techniques. Rarely do these teachers feel adequately trained to the extent that they could disseminate their newly acquired skills with their colleagues. Without dissemination aspect to their training, the

methodologies become person-specific and not team- or building-specific. If a teacher who is trained in the methodology leaves and no one else has expertise in that area, so goes the measurement aspect of that specific program. This dilemma has been occurring in many classrooms providing instruction for students with mental disabilities.

The second goal of the project is to shift the total responsibility from the teacher and focus on data collection from a team approach perspective. This project has focused on training teams consisting of a classroom teacher, building principal, school psychologist, and special education consultant. Data should be collected so that when decisions are made they can be team-based with all team members having knowledge of measurement concepts and how they apply to their individual areas of expertise.

Each team member brings a unique area of expertise and skills. The teacher's role is critical because of the active involvement in the instructional process. The building principal's administrative support is invaluable when budgets are developed or disseminating information to other professionals in the district. The teacher will need to rely on the principal to assist with decisions when other support service team members are unavailable. Who better than the principal whose function is multifaceted, including being of support to the teacher when other support service personnel are out of the building.

School psychologists can contribute data they collected during comprehensive evaluations of individual students and the collection of data that is more formative in nature. With the application of previously trained observations skills, school psychologists can provide direct or

indirect consultation on the assessment and data collection of behaviors which detract or enhance a student's ability to learn.

This type of information is used by the special education consultant who has expertise in the area of curriculum. Knowing how the student is able to process information effectively will allow the consultant to advise the teacher on what types of curricular approaches or strategies might best maximize the student's potential to learn. Through data collection techniques, information can be obtained on the incorporated strategies to see what effect they have on a student's performance. This data could also have implications on future Individual Education Programs (IEP) for not just that individual student, but other students in programs which the special education consultant has responsibility.

The third goal is to provide consistent follow-up for the inservice participants to assure learning. The measurement project has been set up so that participants receive follow-up consultation services through newsletters, telenets, personal correspondence, and on-site visitations. The manual and videotape prepared by David Schoemer and Linda Miller is another effort to facilitate your learning and your working with other educators.

Your responsibility in utilizing this material is to generalize what you have learned to other professionals. Most of you will have received the initial training prior to reviewing this information. We are hopeful that your team will be training others in your area. This manual and videotape will assist you in this process. If you have not received the training, we hope that the tape and manual will get you started in thinking about some possible changes. We hope you make use of these materials and would encourage letting us hear from you.

The purpose of this manual is to accompany the videotape modules on measurement concepts. Each section is developed to correspond and enhance the videotape with written information. Included in each section will be relevant overheads and graphics that can be utilized for replication purposes. Also included will be other print material that relates to each specific section. This material has been compiled from a variety of sources and is included in this manual to enhance understanding and dissemination of direct and daily measurement approaches with mentally disabled students in the state of Iowa.

The sections are arranged in a format that progresses sequentially in the same manner that information on student learning is collected and utilized. The first section discusses the philosophy of formative or process-based evaluation and how it differs from the permanent product assessment we typically use in special education to assess student performance. The next section provides a philosophy of decision making that relies on an ABMC model, where A stands for antecedent conditions and interventions, B represents the behaviors being measured, M stands for the measurement component, and C indicates consequation interventions that are typically arranged after the behavior occurs and are designed to enhance or eliminate the behaviors in question.

The third section includes material on basic measurement components including pinpointing, recording, and charting with an emphasis on precision teaching resources. This emphasis is provided not because precision teaching represents the only viable measurement strategy but, rather because of the comprehensive nature of the PT process. The basic measurement components and technology of PT can be generalized to other

charting and graphing techniques providing both adaptability and sophistication in all of our information collection activities.

The next section discusses decision making guidelines that significantly enhance the utilization of the data collected. In order for process information to be valuable and worth the effort to collect, it must be not only be looked at frequently, but also must direct instructional decision making. Several decision making rules or guides also developed from PT technology but readily adapted are presented.

The Appendix includes a complete set of overhead masters which can be used by those special education teams interested in providing workshops and dissemination activities.

Greg and Jeff

The complete set of overhead masters mentioned above were removed prior to filming as the masters were duplicates of those the follow each section.

SECTION 1

OVERVIEW AND PHILOSOPHY OF MEASUREMENT

This section and corresponding module discuss the differences between the more typical measurement approach in special education (summative) and the process measurement presented in this project. Also included is a general philosophy of measurement that considers relevant learning variables that are both home and school related. The research of Wallberg (1984) and associates is presented and included in the written material. A more detailed presentation of "types of measurement" as it is presented in the workshop is also part of this section. Relevant overheads are included in the last part of this section.

II. C. OVERVIEW - TYPES OF MEASUREMENT

Section: Overview
Length: 1 hour
Method(s) of Presentation: Lecture
Activities = Timings

Expected Concepts Learned:
1. Understanding of two measurement processes: summative and formative.
2. Utility of precision teaching as a method of direct, daily measurement.

Materials: Facilitator Notes
Transparencies
PT folders with map practice sheets
Pens, sponges, paper towels
Timer

II. OVERVIEW

Transparency

*Types ...

C. Types of Measurement

1. Summative: Sampling what a student knows at the termination of a process. Evaluates a teacher, curriculum, or grades students
   a. pre-/post-testing
      1) types.
         a) standardized tests of achievement.
         b) criterion-referenced. Record of skill mastery. Criteria for learning/change established prior to teaching.
            (1) scope and sequences.
            (2) task analysis/skill checklists.
            (3) progress/mastery graphs rate of student progress at mastering a set of instructional objectives. Encourages mastery learning.
               (a) series of objectives - left side.
               (b) time across bottom.
         c) teacher made tests.
         d) rating scales, self-reports.
      2) functions/limitations.
         a) indicate student performance at beginning/end of a program/ process.

Transparencies
*Task Analysis
*Skills Checklist
*Progress Chart

b) can identify student strengths and weaknesses on long-standing, stable characteristics and to measure change over a long period of time. Not sensitive to minor fluctuations - specific skills.

c) need a standard to determine significance of a student's performance levels and changes to them.

Transparencies
*Social Skills Record
*Archival Records

b. product measures

1) types.

a) analogue observation i.e., social skills role playing groups, red flag.

b) archival records i.e., attendance, discipline, grades, parent contacts.

2) function/limitations.

a) can use existing records.

b) is difficult to establish performance standards.

c) may be difficult to retrieve.

d) question validity as a skill document.

Transparency
*Formative/ Process Measurement

2. Formative/process: intervenes during the formation of a student

a. definition

1) evaluates student learning during the course of instruction. Is continuous, direct.

2) describes the course of change - how behavior changes over time on a single task.

3) impinges on smaller, comparatively independent units of instruction.

4) improves teaching, learning curriculum construction

5) measures shorter term progress.

6) ties progress to the intervention (relatedness) and provides systematic feedback to the teacher in order to assist him/her in making intervention adjustments.

Transparency
*Strategy of Viewing ...

7) are "document-as-you-go" procedures - the problem defines the method used.

8) complements pre-/post.

b. types

Transparencies
*2 Duration Recording Records

1) duration recording.

a) amount of time spent performing a given behavior.

b) use for low frequency high intensity behavior where counting is not relevant.
c) requires clear, concise definitions of behavior in observable terms and precision timing.

Transparencies
*4 Interval Recording Records

2) frequency counting.
a) number of times a behavior occurs in a block of time.
b) used when behavior occurs at a rate low enough to count reliably and when it is easy to pinpoint a beginning and end of each behavior.
c) methods.
(1) systematic observation: requires that someone maintain continuous attention of the student during a specified block of time.
(2) point systems
(3) self-monitoring/self-recording: student observes, records own behavior.

Transparencies
*Clock
*What is PT?
*PT Can Provide the Answers
*What PT is Not

3) precision teaching - direct, daily measurement.
a) introduction
(1) a process for measuring student change.
(2) a process for deciding what to do about a student's education.
(3) process for timed practice of skills; thereby, facilitating development of skill proficiency.
(4) a process for recording where a student is and where the student is headed.
(5) a process for communicating with the student, parents, teachers, and others about individual learning.
b) based on direct, daily assessment.
c) not a technique nor instructional.
d) is student-managed.
e) how many are familiar with PT? SIMS?

(1) one of the seemingly most overwhelming factors is the charting.
(2) it will all come together at the end.
(3) assess students daily (5-10 min/day).

Transparencies
*"Smiley" Face - "Show Me a Child..."

4) PT provides four things:
a) performance standards (e.g., 70-90 digits/min.; spell 80-100 letters/min.; read 200 wpm).
(1) proficiency = higher utility/greater retention. ex. add facts - 100 w/ 100% accuracy on 10 minutes; 100 w/ 100% accuracy in 1 minute.
(2) mastery = "I can do it" proficiency = "I can do it well" (has internalized skill - made it automatic).
(3) examples:
(a) typing.
(b) piloting a plane.
(4) almost everything is a function of fluency.

Transparancy
*Acquisition → Proficiency

Transparency
PT Provides ...

b) 2nd thing provided = standard behavior chart. Is a record of results that reinforces students.
c) decision-making guidelines. e.g., at aim 2 of 3 days
3 days flat data
d) 12,000 practice sheets - elaborate.
(1) materials bank
(2) 4 books - 2 math, 2 language arts.

- -

Review PT Folders and Their Parts With Participants

The folder is not inherent with PT, but it was devised and found useful by teachers.

Describe Parts

- -

Timing/Maps: Give participants time to study their maps. Instruct them on how to begin.

"Ready" "Please begin" "Thank you"

Correct: Put answer sheets in place.
Circle every correct answer.
Count as you correct.
Errors = ones you wrote, but didn't circle/count.

Chart: Date/Score.
Request that someone share student's score with the group.

Timing/Maps: Give participants time to study.

"Ready" "Please begin" "Thank you"

Chart

Timing/Maps Study.

"Ready" "Please begin" "Thank you"

Chart

Seek volunteer to share all three scores.
"She went up. How many others did?
You will monitor growth/change week to week."

Transparency Blank — Develop a vocabulary list on blank transparency:

1. Timings: Samplings of a child's knowledge about a skill.
2. Practice Sheets: Skill. not test sheets. Represent a pinpoint (i.e., the skill).
3. Learning Channels: Input/Output, e.g., S/W = See/Write
4. Acquisition: Initial learning.
5. Mastery: Accuracy.
6. Proficiency: Accuracy + Fluency (speed).
7. Frequency:

$$\frac{\text{Count}}{\text{time (minutes)}} \quad \text{i.e.} \quad \frac{\text{\# Correct}}{\text{\# minutes}}$$

Always standardize as response s/minute
ex: 2/30" = 4/min.
40/20" = 2/min.

8. Tool Skill: Pre-requisite skill.

9. Phase: Each skill or aspect.
10. Practice Sheet: Rate sheet.
11. Celeration: Acceleration or deceleration. Drop Ac- or De-. Just use "celeration," i.e., change from week to week.

Transparency Blank

"Can predict from 9-11 days' data"

Elise	10	20	40	(X2.0)
Ann	20	20	20	(X1.0)
Jo	4	6	?	(X1.5)

Small # Large # 1.5
4 6

Can do as %
X1.50 = 50% growth
X1.75 = 75% growth
X1.99 - 99% growth

"Deceleration = divide by ( ) celeration."
e.g.. 6/1.5 = 4

INSTRUCTIONAL QUALITY & TIME EFFECTS ON LEARNING

METHOD	EFFECT	SIZE
REINFORCEMENT	1.17	XXXXXXXXXXXX
ACCELERATION	1.00	XXXXXXXXXX
READING TRAINING	.97	XXXXXXXXXX
CUES & FEEDBACK	.97	XXXXXXXXXX
SCIENCE MASTERY LEARNING	.81	XXXXXXXX
COOPERATIVE LEARNING	.76	XXXXXXXX
READING EXPERIMENTS	.60	XXXXXX
PERSONALIZED INSTRUCTION	.57	XXXXXX
ADAPTIVE INSTRUCTION	.45	XXXXX
TUTORING	.40	XXXX
DIAGNOSTIC PRESCRIPTIVE METHODS	.33	XXX
INDIVIDUALIZED INSTRUCTION	.32	XXX
INDIVIDUALIZED MATHEMATICS	.32	XXX
TEACHER EXPECTATIONS	.28	XXX
COMPUTER ASSISTED INSTRUCTION	.24	XX
SEQUENCED LESSONS	.24	XX
CLASS SIZE	.09	X
PROGRAMMED INSTRUCTION	-.03	-.
MAINSTREAMING	-.12	-X.

NOTE: THE "X" SYMBOLS REPRESENT THE SIZES OF EFFECTS IN TENTHS OF STANDARD DEVIATIONS.

HOME, PEER, CLASS MORALE, AND MEDIA EFFECTS

METHOD	EFFECT	SIZE
GRADED HOMEWORK	.79	xxxxxxxx
CLASS MORALE	.60	xxxxxx
HOME INTERVENTIONS	.50	xxxxx
HOME ENVIRONMENTS	.37	xxxx
ASSIGNED HOMEWORK	.28	xxx
SOC. ECONOMIC STATUS	.25	xxx
PEER GROUP	.24	xxx
TELEVISION	-.05	x.

NOTE: THE "X" SYMBOLS REPRESENT THE SIZES OF EFFECTS IN TENTHS OF STANDARD DEVIATIONS OR CORRELEATIONS.

CHILD VARIABLES

** INTELLECT
** PERCEPTUAL SKILLS
** PRIOR KNOWLEDGE
** MOTIVATION

TASK VARIABLES

** INPUT-OUTPUT COMBINATIONS
** PRE-REQUISITE SKILLS
** RATE OF PERFORMANCE
** PROFICIENCY REQUIREMENTS
** CUES-SEQUENCING

INSTRUCTIONAL VARIABLES

** TEACHING STYLE
** LESSON LENGTH-DELIVERY
** STUDENT GROUPING
** METHODS/MATERIALS
** TIME ON TASK

HOWELL, 1984

1) OPPORTUNITY TO LEARN

2) PERSEVERENCE

3) QUALITY

4) ABILITY TO UNDERSTAND

5) APTITUDE - TIME NEEDED TO LEARN

CARROL - WALLBERG, 1984

1) ALLOCATED TIME

2) ENGAGED TIME

3) SUCCESS RATE

4) ACCURACY OF DIAGNOSIS

5) FEEDBACK STRATEGIES

6) ACADEMIC EMPHASIS

BROPHY, GOOD, 1984

TYPES OF MEASUREMENT

SUMMATIVE

** Pre- / Post-

** Product

FORMATIVE

INSTRUCTION: "PUT YOUR COAT ON"

EVAULATION:

DURATION: START_____ STOP_____

BEHAVIORS: PUTTING ON COAT

_____ PICKS UP COAT

_____ PUTS ONE ARM IN SLEEVE

_____ PUTS ONE ARM THROUGH SLEEVE

_____ PUTS OTHER ARM IN SLEEVE

_____ PUTS OTHER ARM THROUGH SLEEVE

_____ DRAWS COAT AROUND SHOULDERS

_____ DRAWS FRONT OF COAT AROUND CHEST

Skills Checklist

pupil _____

task _____ date _____

Item	STEPS: pre-test	discriminate	seen -- copied	letters given - he names words	seen - copied	word heard - spells orally	post-test			
catch										
watch										

pre-test _____% / = correct

post-test _____% ○ = incorrect

Progress Summary Sheet

Student: _____

Date: _____

	Teacher Pretest Score Date: ____	Student Pretest Score Date: ____	Teacher Posttest Score Date: ____	Student Posttest Score Date: ____	Performance Change Pretest - Posttest Teacher	Student
I. Classroom Survival Skills						
1. Listening						
2. Asking for Help						
3. Saying Thank You						
4. Bringing Materials to Class						
5. Following Instructions						
6. Completing Assignments						
7. Contributing to Discussions						
8. Offering Help to an Adult						
9. Asking a Question						
10. Ignoring Distractions						
11. Making Corrections						
12. Deciding on Something to Do						
13. Setting a Goal						
II. Friendship-Making Skills						
14. Introducing Yourself						
15. Beginning a Conversation						
16. Ending a Conversation						
17. Joining In						
18. Playing a Game						
19. Asking a Favor						
20. Offering Help to a Classmate						

Social Skills Record

	Teacher Pretest Score Date:	Student Pretest Score Date:	Teacher Posttest Score Date:	Student Posttest Score Date:	Performance Change Pretest - Posttest Teacher	Student
II. Friendship-Making Skills (cont.) 21. Giving a Compliment						
22. Accepting a Compliment						
23. Suggesting an Activity						
24. Sharing						
25. Apologizing						
III. Skills for Dealing with Feelings 26. Knowing Your Feelings						
27. Expressing Your Feelings						
28. Recognizing Another's Feelings						
29. Showing Understanding of Another's Feelings						
30. Expressing Concern for Another						
31. Dealing with Your Anger						
32. Dealing with Another's Anger						
33. Expressing Affection						
34. Dealing with Fear						
35. Rewarding Yourself						
IV. Skill Alternatives to Aggression 36. Using Self-control						
37. Asking Permission						
38. Responding to Teasing						
39. Avoiding Trouble						
40. Staying Out of Fights						

ARCHIVAL RECORDS

TARDIES

ATTENDANCE
--Class
--School

DISCIPLINE

GRADES

PARENT CONTACTS

BANK BOOKS (Point Systems)

FORMATIVE/PROCESS MEASUREMENT

MEASURES SHORT TERM GROWTH

RELATES GROWTH TO THE INTERVENTION

PERMITS ADJUSTMENT OF THE INTERVENTION

A SEQUENTIALLY DESCRIPTIVE PROCESS

COMPLEMENTS PRE-/POST- ASSESSMENT

STRATEGY OF VIEWING VALUE OF INSTRUCTION

WE USE A PRE-POST TEST TO SEE
HOW WE HAVE DONE

WE USE CONTINUOUS MEASUREMENT TO SEE
HOW WE ARE DOING

YOUR CHOICE!

Duration
Data Sheet (2)

Behavior Modification Duration Recording Instrument

Pupil's Name _____

Observer's Name _____ Position _____

Type of Observation: Pre _____ Progress _____ Post _____

Behavior Observed _____

Score Key: Enter time identified behavior began, followed by time completed, then duration, e.g. 12:33 p.m. - 12:45-15" - 12' 15"

Observation No.	Date	Time Behavior Began	Time Behavior Ended	Duration of Behavior	Total Length of Observation	
					From	To

# of Observations

Remarks:

OBSERVATION SHEET #4

Latency and Duration Recording Data Sheet (2)

Student: _____ Observer: _____

Setting: _____

Operational Definition of:

Behavior initiation: _____

Behavior termination: _____

Date	Time		Latency	Time	Duration
	Presentation of Stimulus	Initiation of Response		Termination of Response	

OBSERVATION SHEET #4
(Example)

Latency and Duration Recording Data Sheet (2)

Student: Suzy Owen Observer: Julie Barnes

Setting: Owen's household

Operational Definition of: using calculator to do math homework

Behavior initiation: turning on calculator

Behavior termination: turning off calculator after all problems completed

Date	Time		Latency	Time	Duration
	Presentation of Stimulus	Initiation of Response		Termination of Response	
4/11/85	7:30 p.m.	7:45	15 mins.	8:00	15 mins.
4/15/85	6:32 p.m.	6:53	21 mins.	7:00	7 mins.
4/16/85	8:00 p.m.	8:13	13 mins.	8:25	12 mins.
4/17/85	8:30 p.m.	8:40	10 mins.	9:03	23 mins.

* In this example, the stimulus is, "Suzy, how about going upstairs and doing your math homework now?"

OBSERVATION SHEET #5

Interval Recording Data Sheet (4)

Single student, single behavior

Student: _____ Observer: _____

Date and Setting: _____ Time Start and Stop: _____

Operational Definition of Behavior: _____

_____

10-second Interval

Minutes	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

OBSERVATION SHEET #5
(Example)

Interval Recording Data Sheet (4)

Single student, single behavior

Student: Sam Brown Observer: Julie Barnes (teacher associate)

Date and Setting: 2/20/85 Time Start and Stop: 11:15-11:30 a.m.

Operational Definition of Behavior: throwing an object = X

(O = nonoccurrence)

10-second interval

Minutes	1	2	3	4	5	6
1	X	O	O	X	O	X
2	O	X	O	X	X	X
3	X	X	O	O	O	O
4	O	O	X	O	X	X
5	X	X	X	O	O	O
6	O	X	O	X	O	X
7	X	O	O	O	X	X
8	O	X	X	X	O	O
9	O	O	X	O	X	X
10	X	X	O	X	O	X
11	X	O	X	O	X	O
12	O	X	X	O	O	X
13	X	O	O	X	X	O
14	X	X	O	O	O	X
15	O	O	X	X	X	O

OBSERVATION SHEET #6

Interval Recording Sheet (4)

Student: _____ Observer: _____

Date and Setting: _____ Time Start and Stop: _____

Multiple behaviors _____, _____, _____

Minutes*							
1'-1				6'-1			
2				2			
3				3			
4				4			
5				5			
6				6			
2'-1				7'-1			
2				2			
3				3			
4				4			
5				5			
6				6			
3'-1				8'-1			
2				2			
3				3			
4				4			
5				5			
6				6			
4'-1				9'-1			
2				2			
3				3			
4				4			
5				5			
6				6			
5'-1				10'-1			
2				2			
3				3			
4				4			
5				5			
6				6			

*Key: + = appropriate, - = inappropriate (will not apply for all behaviors)

Target: observe during odd minutes Comparisons: observe during even minutes

OBSERVATION SHEET #7

Interval Recording Sheet with Graph (4)

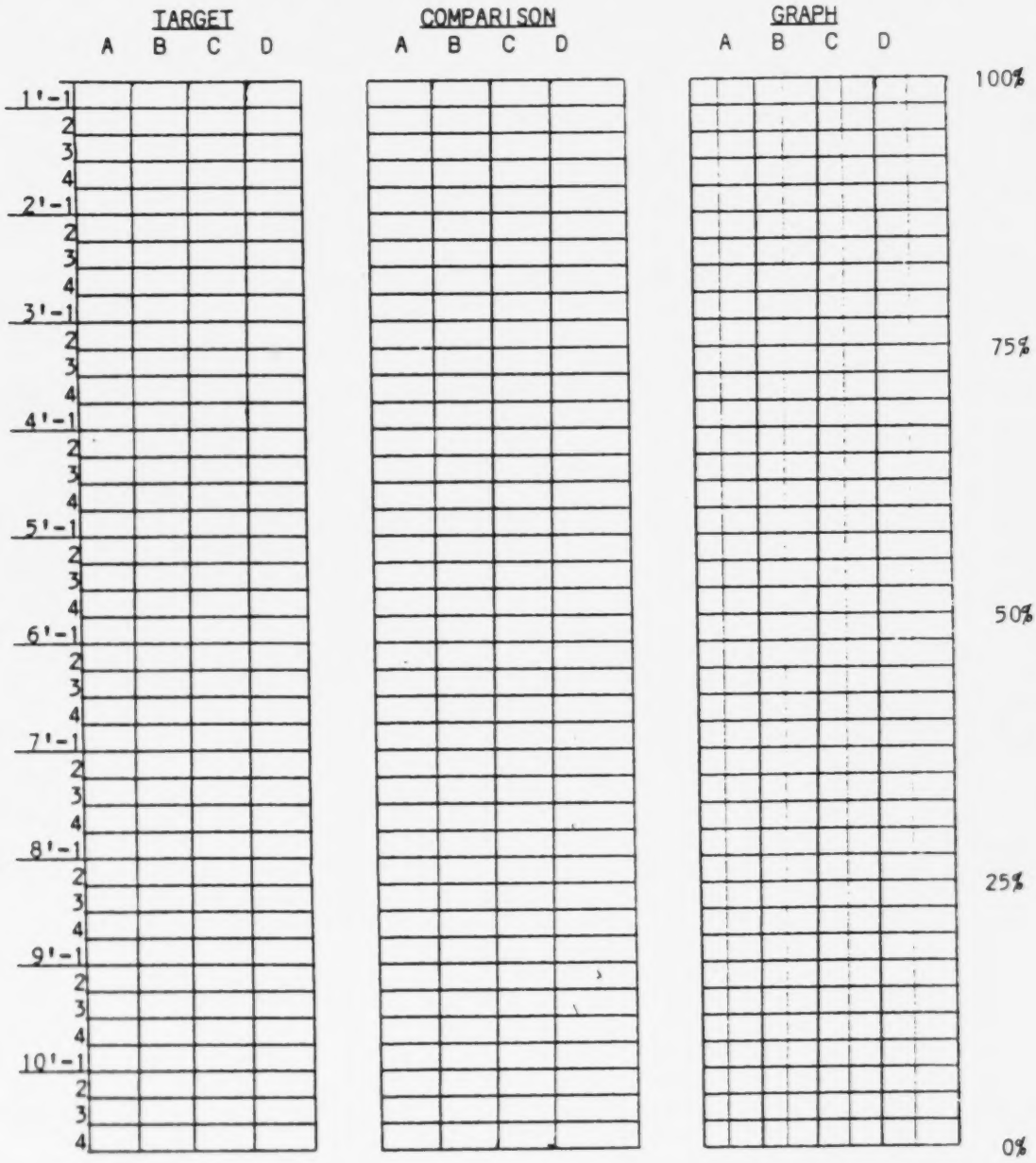
Student _____ Observer _____

Activity _____ Date _____ Time _____

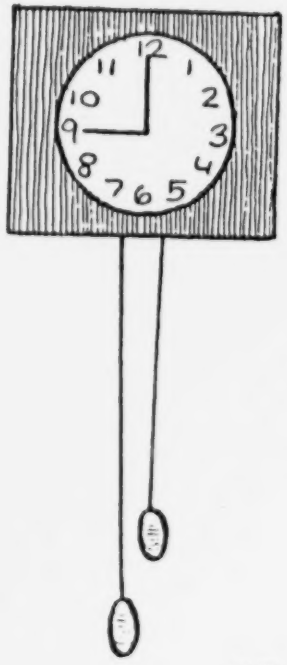
Student Behaviors:

A. _____ C. _____

B. _____ D. _____



Precision teaching is a set of measurement procedures that is based on direct and daily assessment.



WHAT PRECISION TEACHING IS

A PROCESS FOR MEASURING STUDENT CHANGE

A PROCESS OF DECIDING WHAT TO DO ABOUT A STUDENT'S EDUCATION

A PROCESS FOR TIMED PRACTICE OF SKILLS

A PROCESS FOR RECORDING STUDENT PERFORMANCE

A PROCESS FOR PROJECTING STUDENT GROWTH

A PROCESS FOR COMMUNICATING STUDENT LEARNING

PRECISION TEACHING PROVIDES ANSWERS TO THE FOLLOWING QUESTIONS ---

WHAT SPECIFICALLY DOES THE STUDENT KNOW?

WHAT SPECIFICALLY DOES THE STUDENT NOT KNOW?

WHERE DO I BEGIN TEACHING THE STUDENT?

HOW DO I INCREASE THE STUDENT'S MOTIVATION?

HOW DO I KEEP TRACK OF THE STUDENT'S PROGRAM?

HOW DO I KNOW WHEN THE STUDENT HAS MASTERED A SKILL?

WHAT PRECISION TEACHING IS NOT

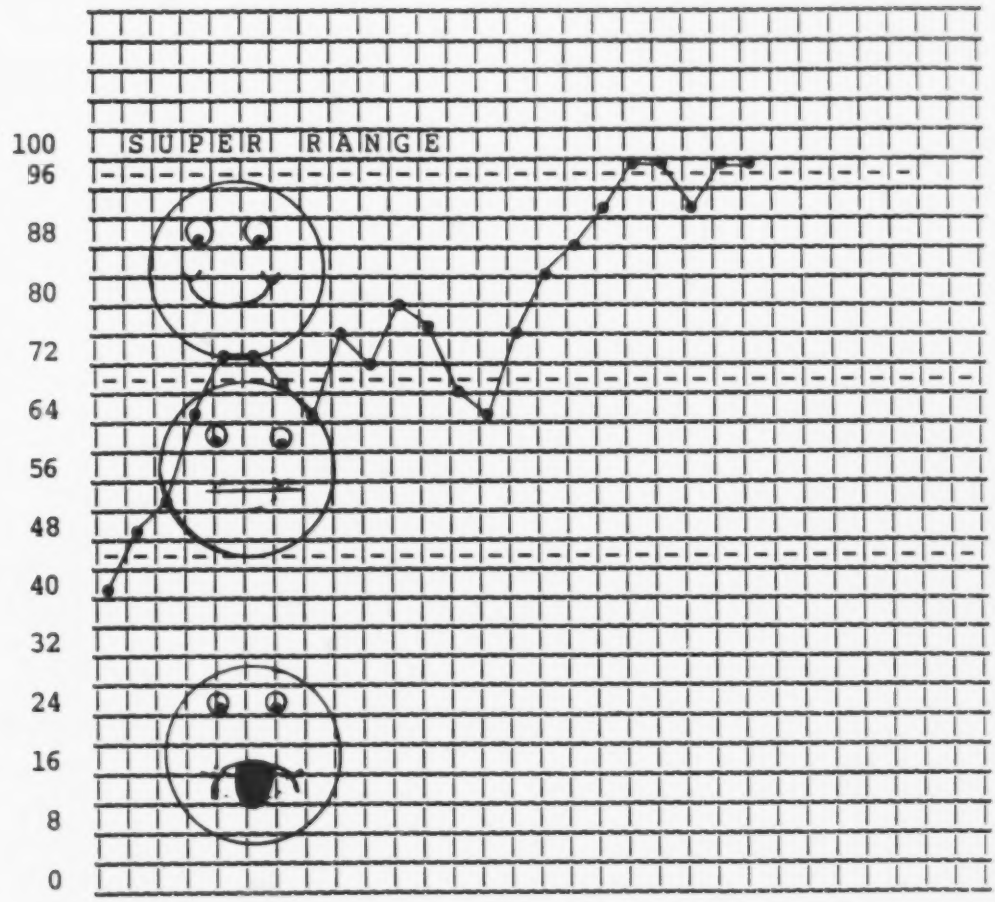
A CURRICULUM

A TEACHING TECHNIQUE

A BEHAVIOR MODIFICATION PROGRAM

OLD FASHIONED DRILL AND PRACTICE

PRECISION TALKING OR LECTURING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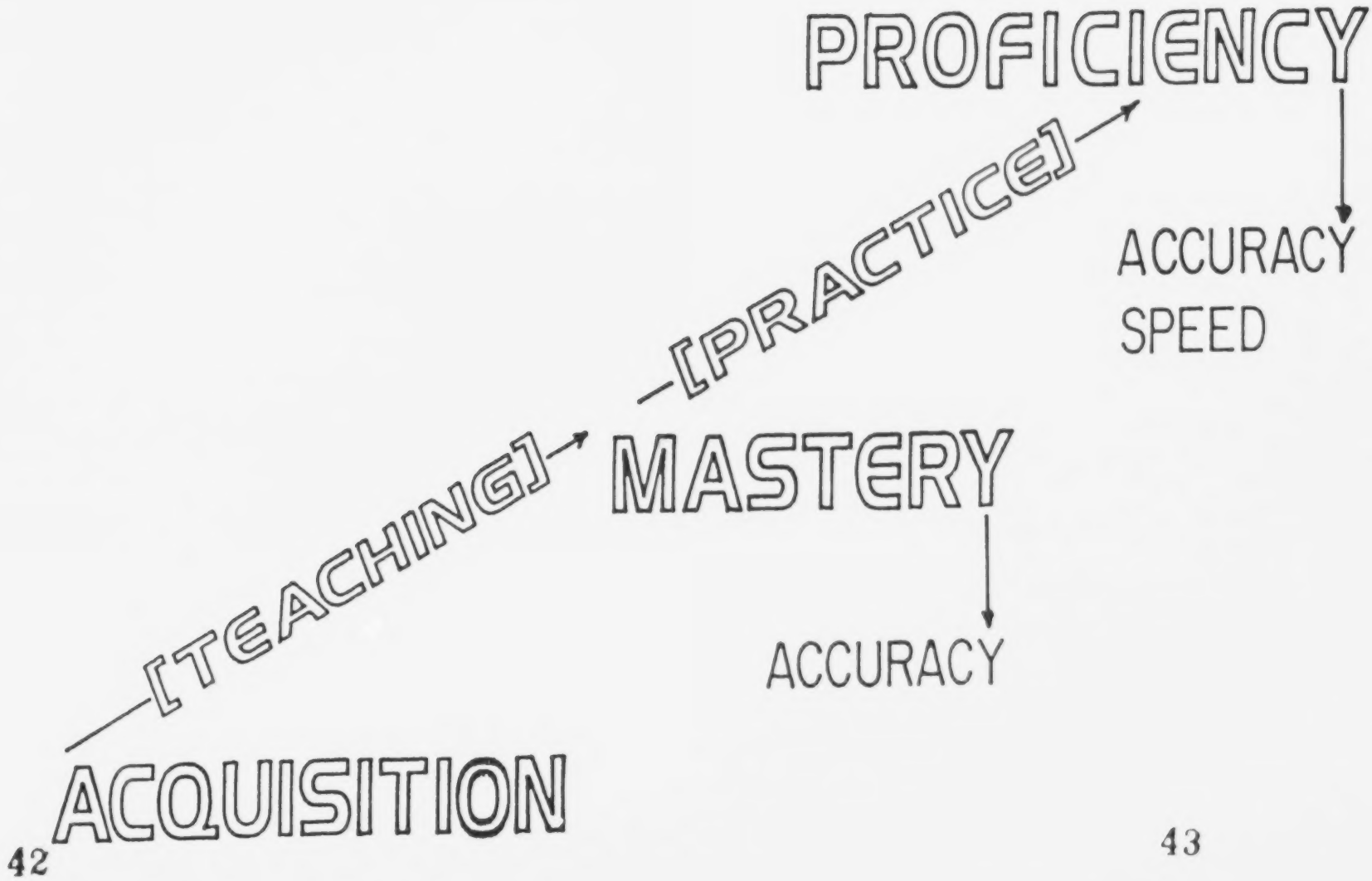
PROFICIENCY
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ACCURACY
SPEED
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MASTERY
ACCURACY
ACQUISITION

SECTION 2

THE ABMC MODEL OF DECISION MAKING

This section corresponds to modules 2 and 3 on the videotape which discuss the ABMC model of decision making. This model is presented because it represents a powerful source of instructional options when teachers are confronted with teaching and learning problems in which there is no observable growth. Process or formative measurement, because of its discreet nature, will reveal learning patterns that are both improving or not growing. When we have projects that are not showing improvement or may in fact be getting worse, there is a critical need for resources that may help broaden our pool of instructional interventions. The ABMC helps direct this search by accentuating both consequation (reward, punishment) and antecedent (instructional arrangements) options. The written material included in this section can be most effectively used in conjunction with the more elaborate material presented in the two modules.

There are several major themes that provide the underlying philosophy of continuous measurement.

1. Learning is defined as behavior change over time. In order for measurement to be relevant, it must occur on a direct (specific behavior of concern) and daily (as frequently as the skill is actually taught) basis. The major purpose of measurement is to:

   GUIDE INSTRUCTION

2. Continuous measurement is only really valuable if it leads to better decision making. The measurement mechanics (pinpointing, collecting, charting, deciding) presented in the workshop are most

effective if they are integrated into a decision making model. This model should focus our attention on the instructional variables we can "control". The ABMC model provides this focus. If the data indicates a need for change, refer to the model for variables to alter. For example:

Antecedent Variables	Behavior	Consequence
Goals	Academic	Rewards
Curriculum	Social	Punishment
Expectations	Self-help	
Methods		
Materials		
Information		
Pace		
Success Level		
Lesson Structure		
Review-meaning or relevance		
Examples-discrimination		
Consolidation-practice		
Time		
Lesson Length		
Time of Day		
Sequence of Instructional Activities		
Grouping		
Child Variables		
Capability		
Maturation		
Motivation		

3. The use of consequation (rewards, penalties, punishment) represents only one side of the instructional paradigm. We need to make sure we are teaching first and then consequating. This is especially true of social or self-help behaviors that are most characteristically taught with a heavy reliance on consequences to shape their development. When this is true, the word "taught" is really an incomplete term since information is only provided through feedback. Social skills training and self-help curriculums provide an informational starting point to insure that we are actually "teaching" our students.

4. Precision teaching components were accentuated in the workshop because they represent the most sophisticated measurement methodology to date. The basic process of pinpointing, collecting, charting, and deciding are transferrable to any continuous measurement effort. As long as direct and daily samples are charted along with teacher decisions, the procedure is intact.

5. Two articles have been included. In the Journal of Precision Teaching, Owen White presents a lighthearted but compelling examination of aim frequencies and how they can be established. This article helps answer the recurring question of "How fast is fast? Or how will I know when my students are competent?" The second article illustrates how continuous measurement strategies can be comprehensively implemented throughout the entire special education process including eligibility determination for both learning disabled and behaviorally disabled students. It would be interesting to visit Sandstone, Minnesota, to see their process in action.

REINFORCEMENT CONSIDERATIONS

REINFORCEMENT STRATEGIES

REINFORCE IMMEDIATELY

SPECIFY CONDITIONS OF DELIVERY

DELIVER QUANTITY TO MAINTAIN NOT SATIATE

SELECT REINFORCER APPROPRIATE TO INDIVIDUAL

USE VARIETY OF REINFORCERS AND REINFORCING SITUATIONS

USE REINFORCERS FOUND IN NATURAL ENVIRONMENT

PROVIDE OPPORTUNITY FOR REINFORCER SAMPLING

ELIMINATE OR REDUCE COMPETING CONTINGENCIES

REINFORCE EVERY RESPONSE INITIALLY

PLAN FOR INTERMITTENCY, DELAY OF REINFORCERS AND GENERALIZATION ONCE BEHAVIOR HAS INCREASED SUFFICIENTLY

GOALS/EXPECTATIONS

INSTRUCTIONAL MATERIALS & METHODS

TEACHING STRATEGIES

- LANGUAGE
  - LENGTH
  - COMPLEXITY
  - VOLUME
  - TONE
- INFORMATION
- INSTRUCTIONS
  - PROMPTS
  - CUES
  - MODELING
- PACE
- SUCCESS LEVEL
- LESSON ARRANGEMENT
  - STRUCTURING
  - DEMONSTRATING
  - CONSOLIDATING

DIRECT INSTRUCTION PRACTICES

PACE

PRACTICE AT 80%

FEEDBACK

ENGLERT, 1985

TEACHING BEHAVIORS >>>>>>>>>>
>>>>>>> STUDENT ACHIEVEMENT

---

1) ENGAGED TIME

2) PACE

3) SUCCESSFUL PRACTICE

4) FEEDBACK

GROUPING

SIZE

PEER BEHAVIOR AND MODELING

OPPORTUNITY FOR INCIDENTAL LEARNING OR DISRUPTION

SEATING ARRANGEMENTS

TIME

TIME OF DAY

LENGTH OF TASK

SEQUENCE OF INSTRUCTIONAL TASKS THROUGHOUT THE DAY

REEXAMINING CHILD VARIABLES

PHYSIOLOGICAL NEEDS
- NUTRITIONAL
- AUDITORY
- VISUAL
- PERSONAL

APPROACHES TO A TASK

KINDS OF CUES SELECTED

STRATEGIES OF ORGANIZATION

SPEED OF DECISION MAKING & RESPONSE

TOOL SKILL RATES

PERSISTENCE, ATTENTION, & CONCENTRATION

SELF EVALUATION ABILITY

CURRENT EMOTIONAL STATUS

FAMILY & PEER DYNAMICS

SOCIAL STATUS IN CLASSROOM

SKILL DEVELOPMENT FOR THE PARTICULAR TASK

- ACQUISITION
- FLUENCY BUILDING
- PROFICIENCY

INTERVENTIONS THAT ARE PRIMARILY ANTECEDENT IN NATURE

CLASS MEETINGS FOCUSING ON CLASS CLIMATE, DISCIPLINE, ETC.

CHANGING THE ATMOSPHERE WHERE THE BEHAVIOR OCCURS.

COUNSELING INTERVENTIONS THAT PRIMARILY PROVIDE THE STUDENT MORE INFORMATION ABOUT HIS BEHAVIOR OR A FRAMEWORK FOR EXAMINING HIS BEHAVIOR BEFORE IT OCCURS.

INTERACTIVE INTERPERSONAL

PROBLEM SOLVING

INSTRUCTIONAL

ACTIVITIES DESIGNED TO ENHANCE SELF CONCEPT

ESTABLISHING POSITIVE INTERPERSONAL RELATIONSHIPS

SOCIAL SKILLS TRAINING

ROLE PLAYING

VIDEO TAPING

FEEDBACK

SELF MONITORING

INSTRUCTIONAL VARIABLES

Modified Methods

Teacher directed	Student directed	Materials directed
Auditory/verbal	Visual	Multisensory
Cooperative learning	Peer tutoring	
Large group	Small group	Individualized

Modified Materials

Lowered reading level	Programmed
Learning activity packets	Job sheets
Activity cards	Tape recordings
Language master	Multi-media
Computer	VCR
Learning games	worksheets
Other _____	

Modified Teacher Expectations

Difficulty level	Assignment length
Time to complete assignments	Performance level
Percent of task completion	Percent of task accuracy

Modified Learning Channels

Input:	Output:
see	think
hear	write
think	say
point	mark
touch	do

Methods of Practice

Worksheets	Language master
Flashcards	Drill
Peer tutoring	Other _____

Testing Methods

Type	Schedule
Written	Daily
matching	Pop quizzes
multiple choice	Weekly
essay	Upon completion of unit
other _____	Continuous
Oral	Other _____
with teacher/student	
tape recording	pre-/post-
	product
Demonstration	process

Study Tools

Outlines	Preview questions
Study guides	Cues/mneumonic devices

Grading/Feedback Systems

Type
- Letter
- Percent-accuracy
- Number wrong
- Number correct
- Verbal comments, positive
- Verbal comments, negative
- Wrong answers marked
- Correct answers marked

Schedule
- Daily
- Weekly
- Upon completion
- Quarterly
- By semester
- Continuously

By whom
- Teacher
- Student
- Group
- Not evaluated
- Correction expected

Behavior Management

Type
- Counseling
- Point system (describe)
- Time out
- Contracting
- Teacher-designed (describe)
- Other _____

Feedback/Rewards
- Points/tokens
- edibles
- Tangibles
- Grades
- Praise
- Privileges
- Activity
- Progress charts

Schedule
- Continuous
- Intermittent

Environmental Modifications
- Seating assignment
  - Teacher assigned
  - Management of materials

Schedule
- Type of desk
- Other _____

AIM*STAR WARS

[Setting AIMS that COMPETE]

Owen R. White
University of Washington

Episode I: The Deathstar

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> Once, a long, long time ago, on a charted performance record far, far from aim, the Learner Rebels were struggling to overthrow the bonds of the evil Normie Empire. Meanwhile, on the desert planet of Kanada, far below the conflict which raged above him among the Uni-versa-tay battle cruisers, young Eric dreamed of leaving Uncle Owen's organic behavior farm and becoming a star-fighter for the Learner Rebels.* "Performance Standards! Who needs them?", he shouted (Haughton, 1982).

It will take Uncle Owen a long time to understand. Perhaps, though, there is still time before the storm troopers overrun his small, isolated, not very special homogenized behavior dairy. Just perhaps. This is the story of Uncle Owen's struggle.

Two years before young Eric hurled his angry challenge at the stars he was carefully considering what he had learned about performance aims (Haughton, 1980). He wrote of the basic reasons for establishing aims, reviewed more than a little of the history behind attempts to find meaningful performance aims, and charted a path for future growth. Basically, he identified four possible advantages for establishing high standards: (1) improved skill retention over periods of disuse, (2) greater endurance over periods of intense skill use, (3) improved rates of learning with related but more complex tasks, and (4) improved performance quality. With the possible exception of performance quality, Eric contended that a skill would generally prove more useful as higher frequencies were achieved. He believed that quality was also likely to improve (e.g., handwriting becomes more legible) as frequencies accelerated, but only up to a certain frequency. Above that point, quality might suffer. Even when seeking greater quality, however, superfluency might still be beneficial. After all, slowing down is always easier than speeding up to meet situational demands.

Fundamental to Eric's arguments, and the arguments of others, is the basic premise that a skill should be useful! It should not be lost once instruction is terminated, nor should it be so effortful that it cannot be used over any reasonable period. Similarly, if the skill in question is one step in a sequence of instruction, then the skill should be sufficiently mastered to allow rapid learning in subsequent curricular steps. That makes sense. I find no fault in the logic. Whether improved frequencies actually lead to those ends is an empirical question, but one for which a great deal of support has been garnered (Lindsley, 1977; Binder, 1981; Haughton, 1972; Berquam, 1981, 1981; Haughton, 1980).

Unfortunately, knowledge of general relationships (improved frequency generally equals improved skill usefulness) does not always transfer easily into specific frequency aims. Several studies with "mixed results" have been reported in which higher frequency aims did not always translate into improved subsequent performance. For example, Haughton (1980) reports a case in which higher frequencies did not lead to superior retention of math skills, a finding later replicated in the Great Falls School District Precision Teaching Project (Clement, 1978). In both of those studies, the authors conclude that relatively low frequencies in math were sufficient to maintain the same low frequencies over time. Possibly those low frequencies will prove to be nonfunctional when learners attempt to apply their skills in daily life. However, that takes more time to study.

It is relatively easy to study the notion that fluency at one step in the curriculum will facilitate progress at subsequent steps. All one need do is compare the celerations achieved in successive curricular steps. If the celerations remain high from one step to the next, the pupil must have been reasonably well prepared to move on. If the celerations begin to fall off, then perhaps the aims were not high enough to prepare the pupil for advancement. Evans, Mercer and Evans (1983) employed just such a strategy and found that, "...a relationship between frequency of saying letter sounds and growth during the subsequent task of saying CVC trigrams was not clearly demonstrated." They concluded that they had not found the "optimum or critical frequency for the prerequisite skill." In other words, faster is still better, we just haven't found the "right frequency..." Maybe, but the whole issue of "prerequisite skills" and the need to develop fluency at each level in a curricular sequence is now being seriously challenged. It would appear that "step ups" and "leap aheads" to high levels in the curriculum

* For those who might be mislead, "Uncle Owen" was not Eric's uncle. Indeed, Eric was Owen's chart father. Owen owes much to Eric, and might not ever have known of the Learner-Force had it not been for him. If Eric felt a reluctance to abandon Owen to his own fate, it was not out of familial loyalty, but rather the concern and patience which only the superfluent can have for the somewhat slow.

will often result in improved learning and (eventually) improved levels of performance, even if the pupil is advanced to those higher levels in the curriculum before earlier, "prerequisite" skills have been mastered or demonstrably acquired (Lindsley, 1981; Eaton & Wittman, 1982; Bower & Orgel, 1981; McGreevy, 1980; Johnson & Jackson, 1980; Haring, Liberty & White, 1980).

So, where are we? What aims do we establish? How do we find that "optimal frequency?"

The issue of a functional frequency aim for a particular skill and a particular learner is still empirical -- we will never know how well a performance aim prepared the learner for meaningful skill usage until we try it and see. Did the learner retain the skill? Did the learner actually use the skill in extrainstructional activities? If so, then our performance aim was at least adequate (if not more than adequate). If not, well try, try, try again (White & Haring, 1980).

The empirical approach to validating an individual's performance aim is certainly desirable and often not difficult. At times, however, it is not possible for us to follow our learners and determine how well we prepared them to succeed. Moreover, we have to have a place to start -- a star by which to guide our ship -- we have to have at least an initial aim or, as one of Eric's second graders pointed out, we'd be "aimless." Where will we find those "rising stars" to guide us in our initial attempt?

The most common approach would appear to lie in the assessment of "normal" or "competent" performers. The vast majority of published aims in the Journal of Precision Teaching and elsewhere are derived by assessing a pupil's peers, adults, or to rely on one or more of the "large project's" data sets (Mercer, Mercer & Evans, 1982). Why? Well, if most kids are able to make it with a certain frequency, then it ought to be good enough for our kids. That may not always be true.

Normal peers are often far from competent. Even the typical adult fails to maintain many skills at the useful level. For example, in a review of the literature, Horton (in progress) noted that approximately 98% of all adults "do not compute." They are so dysfluent in basic math skills that they let the bank or the store clerk do any necessary calculations. When they are forced to work with numbers, they turn to a calculator for even the simplest of problems. (I, myself, was one of the first to own a wrist calculator.)

Difficulty can arise even when we have confidence that the subjects of our "aim-establishing assessments" are indeed competent performers. As Haughton (1980) pointed out, in order to maintain and use a skill at one frequency, it is often necessary to learn and practice the skill at a much higher frequency. Conversely, notes Haughton, our aims may only have to bring a learner up to a level where he or she is able to practice and continue learning without our help. Haughton estimates that an "independent practice" level may be as low as divide-by-two (/2.0) of the eventual fluency desired for the skill. When we assess normal peers and adults, therefore, we may only be measuring what successful performers do, rather than what successful learners must do in order to become successful.

Where then do we go? At least three alternate approaches for setting aims have been suggested. First, one can simply shoot for "superfluency" in all basic skills. Haughton (1977,1980) has suggested 200 to 400 per minute for all basic writing and computation skills, 20000 per minute for "scanning skills," 600 to 1200 per minute for "study reading skills," and 2000 to 3000 notes per minute for competent banjo playing skills -- just to name a few of the pinpoints which interest him. Are these aims reasonable? They are certainly attainable. In at least some cases, however, one might wonder whether much lower "independent practice" or "ready to move on" aims might be more efficient for rapid movement through the curriculum (Evans, Mercer & Evans, 1983).

A second common strategy for estimating reasonable performance aims involves the assessment of "tool skills" (e.g., free/write digits as a tool for see/write digits to answer computation problems; free/say alphabet as a tool for see/say words in context). White & Haring (1980) suggest that tool skill frequencies should be at least x1.5 to x2.0 higher than "contextual use" frequencies. If one wishes a child to write digits to form math fact answers at a frequency of 80 digits per minute, the child should be able to free/write digits at a frequency of at least (80x1.5=) 120 to (80x2=) 160 per minute. Unfortunately, that strategy requires that one has already established the aim for the "use skill." To avoid that trap, one might use the same basic ratios between tool- and use-skill frequencies, but reverse the direction of computation. That is, assess the child's current basic tool skill, divide by a factor of 1.5, and use the resultant figure as the performance aim for higher level skills which use

that tool. If the pupil can free/write digits at a frequency of 100 per minute, then the aim for basic math facts might be (100/1.5=) 67 digits per minute.

The advantage in the "work down from tool skills" approach is that it is always completely defined by the pupil's own performance -- it is not necessary to establish one aim (the use-skill aim) in order to determine another aim (the tool movement aim). However, if the child is not already competent in the tool skill, performance aims for the higher level skill will just reflect that incompetence.

Other variations on the theme of tool-skill/use-skill frequency ratios have been suggested (Eaton and Hansen, 1978), but utilizing tool-skill frequencies as a method of establishing contextual use-skill frequency aims always appears to require some leap of faith -- the assumption that one knows what the use aim should be (so one can establish tool movement aims), or the assumption that the learner's tool movement frequencies are functional (so one can use them to establish higher-level skill aims).

The last strategy for establishing aims which I have seen in practice is really a method for avoiding exact frequency aims altogether. In Shawnee Mission, Kansas, Henri Sokolove encouraged a practice suggested to her by Ogi-Wan Sixcycle, the original Learner-Knight. Each pupil simply works on one step in the curriculum for as long as he or she continues to get better. When the pupil "goes flat," the next step in the curriculum is introduced. No remediation; no added cues; no artificial consequences -- just "move on." Such an approach certainly embraces two concepts dear to the hearts of Precision Teachers -- "listen to the children" (when I stop learning it means that I want something different) and "emphasize learning" (it matters not where I am, just how fast I'm getting somewhere else). To be sure, upon inspecting some of Henri's charts I was surprised at just how low some of the frequencies were (grade level oral reading at 20-50 words/minute). However, the pupils were undeniably progressing nicely through the curriculum and, more importantly, were apparently well into the "independent practice" range mentioned by Haughton (1980). Frequencies on levels of the curriculum no longer directly taught continued to improve.

Despite Sokolove's(1978) very convincing and very extensive data, I must admit that the "as long as you progress" strategy was the most difficult for me to consider. Is the learner always right? Perhaps not, at least when it comes to signaling the end of the need to learn by ceasing to learn. Still, I have become more comfortable with the idea of moving ahead in a curriculum at the earliest possible opportunity. Step aheads and leap aheads are undeniably effective ways of accelerating learning in sequential material with many learners. I am more reluctant, however, to "let the learner decide" when it comes to establishing frequency aims for terminal skills -- skills which should become immediately integrated into the learner's daily behavioral repertoire and which must be maintained and used without continued instructional support -- the end of the line, as it were, in a curricular sequence.

I am simply unwilling,as a teacher, to abdicate responsibility for ensuring that at least minimal competencies are achieved in at least some important skills. I am unwilling to stop the program in dressing just because the learner goes flat at a frequency of .02 dressing sequences per minute, for I know that such a frequency will not be tolerated in the group home. I am unwilling to stop instruction (or at least continued practice) in basic math skills just because the pupil begins to decelerate after reaching 16 digits per minute. I know that such a frequency will not be sufficient for the pupil to keep up in science class...and I suspect that the learner would not maintain or use the skill as an adult.

I feel more comfortable with a "compromise" strategy suggested by Haughton (1977). Essentially, one establishes a "minimum frequency aim" and a "maximum frequency aim." The minimum frequency aim defines the lowest performance you believe will adequately prepare the pupil for advancement in the curriculum or independent use of the skill. If the learner falters before reaching the minimum frequency aim, the program is modified in some way to facilitate continued learning. Once the minimum performance aim is reached, the learner decides what will happen. As long as the learner continues to progress, the program is continued; once the learner "goes flat," the program is ended. A maximum performance aim is set at the level beyond which the teacher/manager is not interested in continuing to work with the skill. If the learner wishes to continue to develop the skill alone, fine, but the manager discontinues formal instruction for that skill and introduces a program to develop some new skill.

Where am I now?

I'm back at square one, trying to decide what those minimal performance aims should be. Am I left with norms, fancy ratios and simple guesswork? Is there no better way to estimate what might be functional? Must we simply "try it and see," follow up, and adjust as necessary? Perhaps not.

After carefully revieving what young Eric, Ogi-Wan, and others (including, of course, the Learner-Rebels themselves) have been trying to tell me over the years, I would like to suggest several considerations which one might make when establishing a preliminary frequency aim. For the moment, I will limit my concern to "terminal proficiency", that is, the level of performance which will make a skill immediately useful to a learner, not just as one step in a sequence, but as an independent skill in it's own right. In short, the aims discussed below are designed to allow the learner to:

[A]dvance to a level of
[I]ndependence,
[M]aintain the skill over time,
and perform some
[S]ervice of importance to the learner.

Each of the considerations which I would like to propose is based on the notion of "competition."

Peer Competition

The vast majority of performance aims are established on the basis of some form of "peer competition." One assesses what most kids do, and then assumes that if a new learner can achieve those levels of performance, the learner will at least be able to "compete." In some cases that may be quite true (e.g., athletic or academic games; competing for a position as a typist). Attempting to provide a learner with "normal frequency" might also be important socially. "Slow kids" stand out, and "differences" can lead to isolation (White, 1980). Providing the learner with the ability to compete with peers can lead to much easier acceptance by peer groups. That's nice. But "normal" is not always nice.

Patsy, a mildly handicapped elementary school student, had a moderate speech problem (difficulty in correctly pronouncing short vowels) that showed up in oral reading and conversation. Ruth Mundt, Patsy's teacher, decided to help Patsy develop more fluency in saying the "hard sounds" by simply having her read from a list of C-(short vowel)-C words each day. To establish Patsy's frequency aim, Ruth logically reasoned that if Patsy could say the sounds as fluently as her nonhandicapped peers, all would be well. A quick assessment of those peers revealed that an aim of 40 sounds per minute should do nicely for putting Patsy "in the middle."

As shown in Chart 1, Patsy had no real difficulty in achieving the aim of 40 sounds per minute. As her fluency approached that of her nonhandicapped peers, her errors just seemed to disappear -- usually a good sign. After discontinuing the program, however, Ruth noticed that Patsy began to slip back into her old habits. When a formal assessment was conducted a month later, Patsy had dropped to half her former fluency and the errors had come back. The program was reinstated, the "normal aim" reached once again, and after crossing her fingers, Ruth terminated the program once more. Three weeks later Patsy was up (down?) to her old tricks, so it was back to the program.

At this point, many fine behavior analysts would point out that Patsy was having difficulty in "generalizing," and that contingencies should be established in the "real world" to encourage and develop the skill where it will actually be used. In other words, Ruth should start prompting Patsy and providing corrective feedback (plus an M&M or two?) throughout the day. Fortunately, Ruth was reluctant to engage in activities which might prove very embarrassing to Patsy (when was the last time someone corrected you in front of your friends?), so she opted to try for superfluency. Ruth doubled Patsy's frequency aim ("...now Patsy, you have a problem, so you must be twice as good as those who do not have a problem..."). It took only an extra 9 days (beyond the old aim of 40 per minute) to reach the new aim. The program was terminated. A month later Patsy was still superfluent. Ruth never noticed a problem after that during reading or conversation. Undoubtedly, Patsy is now a speech therapist or a linguistic specialist in the U.G. (United Galaxies).

Obviously, "competition with peers" was not the appropriate method for establishing Patsy's aim. Ruth was diligent in following Patsy after the program to see if the new behavior was functional, however, and when her faith in the Normies failed, she studied carefully the plans of the Deathstar that young Eric had retrieved while rescuing Princess Learna. She was finally able to locate the weakspot in the monstrous Normie machine. She put her faith in the Learner-Force, and found an aim that worked.

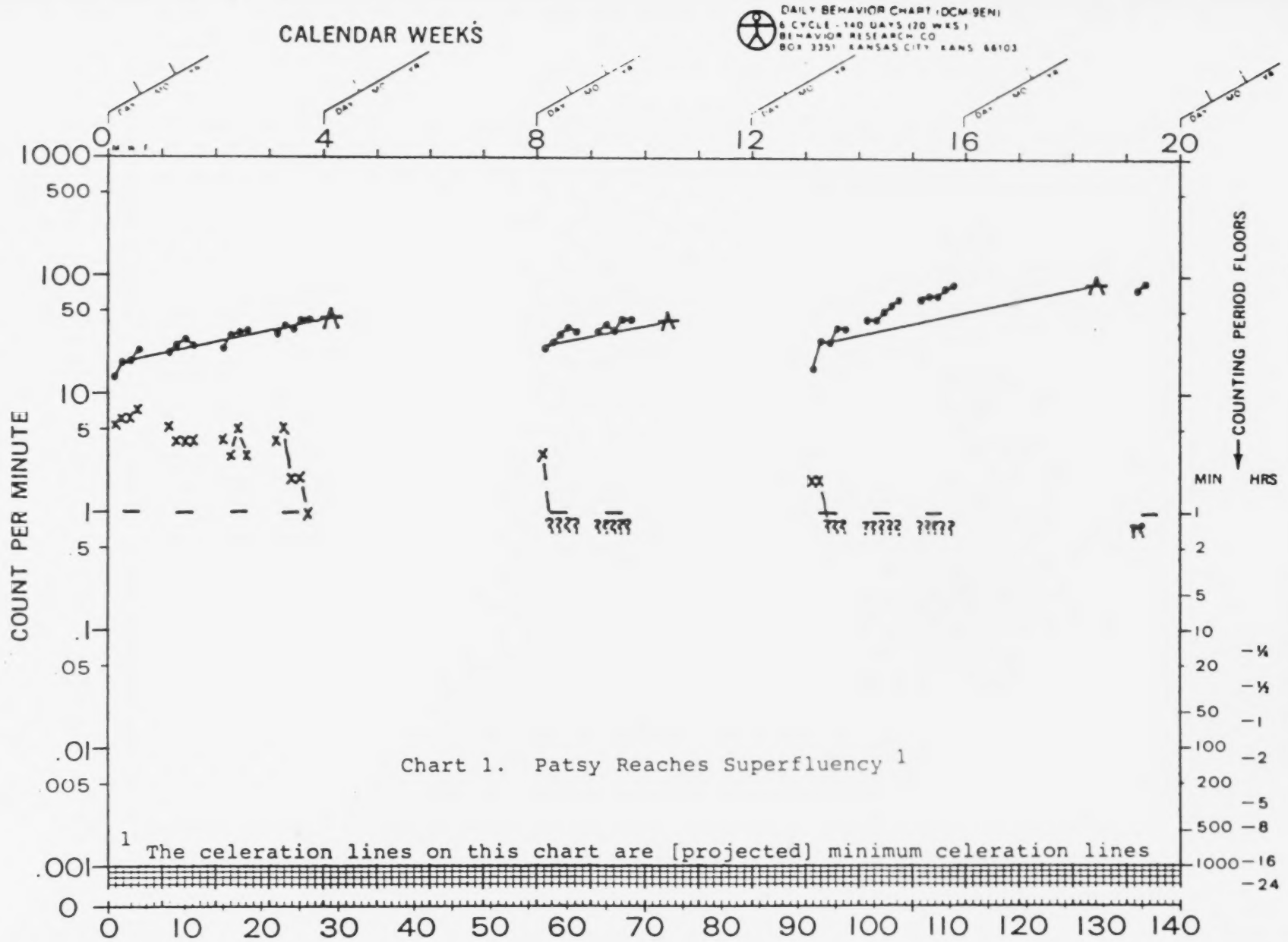

Chart 1. Patsy Reaches Superfluency [1]

[1] The celeration lines on this chart are [projected] minimum celeration lines

	White	Mundt		Patsy	see/say C-(short vowel) words in isolation
SUPERVISOR	ADVISER	MANAGER		BEHAVER	COUNTED
DE[illegible]TOR	AGENCY		TIMER	COUNTER	CHARTER

64

65

Amid thunderous MUSIC**, the Normie Death-star was destroyed.

How might we have guessed before the program started that Patsy needed superfluency? The clue might lie in the consideration of another type of competition, which will be examined in the next episode, "The Return of the Learner."

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** MUSIC, according to Ogi-Wan (Lindsley, personal communication, exact date unknown) represents the things we must remember about learning: learning is by (M)ultiples, not add and subtract; learners are (U)nique, what works with one learner may not work with another; learning is (S)pecific in that something may be "hard to do" but "easy to learn"; "easy to get right," but "hard to learn," etc.; learning is (I)ndependent in that corrects can go up while errors go anywhere, success in one curricular area tells us nothing about other curricular areas, etc.; and learning is a function of (C)onsequences -- you can't tell why something happened until you see what comes after it.

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An Application of Curriculum-Based Assessment: The Use of Direct and Repeated Measurement

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Abstract: A model of special education is presented in this article based on the use of a direct and repeated measurement and evaluation system for developing effective educational programs. The major premise in applying this system is the development of a continuous data base across all educational decisions, including initial problem selection, program planning, program implementation and evaluation, and program certification. To highlight the issues, two separate studies are included, presenting student outcome data at both the individual and system level, for academic and social behaviors.

INTRODUCTION

■ A variation of curriculum-based assessment has been used in the Pine County Special Education Cooperative since 1980. This system focuses on the development of an empirically based special education program, with educational decisions made in the context of student achievement and performance on school-related tasks.

The procedures have extended the principles of curriculum-based assessment into all areas of special education (i.e., speech, vocational skills, high school content areas, independent living), keeping the philosophy and methodology intact. Data have been collected in these domains for determining the adequacy of this system for making all educational decisions, ranging from initial problem selection to final program certification. One of the important advantages to this system is that student performance can be summarized and programs evaluated both for the individual student in a formative manner and for groups of students in a summative manner. The attention in this application of curriculum-based assessment has been less on technical adequacy and more on developing effective and efficient systems. The result has been the development of a series of training manuals covering the implementation of direct and repeated measurement in major skill areas (Germann, 1983a, b, c, d). Regardless of the area, two essential principles underlie the Pine County system:

1. A behavioral approach to identifying and remediating educational problems. Attention is given to student behavior and school environmental demands, rather than to classifying students into unique disabilities. By implication the entire delivery system focuses on overt behavior, with treat-

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ment oriented to manipulating environmental events for changing and/or maintaining behavior.

2. The use of a repeated measurement evaluation paradigm. The emphasis is on the assessment of *change* in performance over time, not on the simple documentation of *level* of performance at one point in time. Implicit in this perspective is the demand that all programs be evaluated since no a-priori decisions of effectiveness are possible.

Two educational domains in which the adapted curriculum-based assessment system has been implemented will be reviewed. The first domain is academic skills and the second is social behaviors.

Within each domain a general overview of the assessment system will be followed by a description of an empirical investigation of the implementation of the system. All data presented in this article represent actual student performance during the 1983–1984 academic year.

The Pine County System

The initial work of Deno and Mirkin (1977) provided the essential framework for the Total Special Education System (TSES) developed in the Pine County Special Education Cooperative. The procedures incorporate direct and repeated measurement into an evaluation paradigm for objectively monitoring program effectiveness at both the student and system levels. The entire delivery system focuses on the discrepancies between the student's performance and specific environmental demands in academic (Germann, 1983a), social (Germann, 1983b), communication, physical, independent living, mainstream (Germann, 1983c), or vocational tasks (Germann, 1983d). Programs are planned, implemented, evaluated, and adjusted to reduce these discrepancies for specific educational behaviors. The effects of the program modifications are continually monitored and evaluated to determine the "least restrictive alternative" (Deno, Jenkins, & Mirkin, 1979), the appropriateness of new programs, and the need for and impact of related services (e.g., summer school, change in level of service). When discrepancies have been reduced to the point at which they are no longer considered important or (dis)functional, special education programs and their modifications are certified as complete and successful.

The Pine County problem-solving system begins when a student is referred to the building Student Support Team (SST). Procedures are initiated for the appropriate special education staff to interview the teacher, parent, and student (if appropriate) to further describe and identify problems. A priority ranking is completed and specific academic, social, communicative, physical, independent living, mainstream, or vocational behaviors are measured to establish an objective basis for defining the problem(s) specified in the referral. Following is a description of the four phases (decisions) comprising the TSES in Pine County.

Problem selection. Initial assessment is directed to specified areas of difficulty in the school curriculum and/or environment rather than to generalized patterns of disability. This step is similar to the "problem verification" phase noted in the behavioral consultation program of Bergan (1977). The essential purpose of this assessment is to verify the nature and intensity of the problems noted in the referral and provide an objective quantification of levels of actual performance and discrepancies. The important assumption on which the assessment is based is that it is the child's performance or progress on mainstream tasks that results in the child being viewed as successful or unsuccessful by the teacher. The child who fails to function on these tasks typically is considered by the teacher to have a problem/handicap. Assessment within the context of the mainstream curriculum consists primarily of determining the child's current level of proficiency on particular components of the curriculum and comparing his or her skills to his or her classmates.

In reading, for example, in what book and on what page in the district's basal reading series can the child currently read at an acceptable level of fluency and accuracy and how does this compare to the child's peers? Similarly, for social behaviors, in what classes or environments is the child excessively noisy, off task, out of place, or in negative physical contact and at what level are the child's peers functioning on these behavior, in these environments? For both of these domains, it is assumed that any individual program, to be successful, must begin by determining where

the child is and move him or her from that point forward as rapidly as possible.

Within this system the expected level of performance, whenever possible, is operationalized as the normative performance of peers. In the academic domain, district norms for both progress (through the curriculum) and/or performance (within the curriculum) in the areas of reading, math, spelling, and written expression have been established. For social behaviors, expected performance is established by using direct observation of classroom peers (Sulzer-Azaroff & Mayer, 1977), documenting any discrepancies between the referred child's social behavior and that of the child's peers. Decisions following assessment revolve around agreement on what the problems are, how important they are, and whether the child is eligible for special education service. The decisions are based on the discrepancy data that are gathered and the priorities that are established by the persons involved (including the child, teacher(s), and parents).

Program planning. The next problem-solving phase involves agreeing upon a written IEP specifying (a) administrative arrangements (levels of service) to be used, (b) annual instructional goals and short-term objectives, (c) procedures for measuring progress on these goals and, (d) teaching strategies (hypotheses) that will be tried (operationalized) in an effort to reduce identified discrepancies. Since the problem or handicap is viewed as the discrepancy between desired and actual behavior, and the assessment measures this discrepancy using curriculum-based stimulus materials and local norms, it is possible to establish meaningful IEP goal statements that are directed at the rate at which the identified discrepancy will be reduced. The efficiency and effectiveness of the problem-solving effort is enhanced because the focus of the data collection process has been on functional discrepancies, as opposed to the more traditional process of identifying "test" discrepancies unrelated to the referring problem, expectations, and school environment (curriculum).

Program implementation and evaluation. During the implementation and program evaluation phase, attempts are made to ensure that the planned program is carried out as intended and that the projected progress is being made. The rate at which goals are achieved determines whether or not alterations or adjustments in the student's program must be made. Evaluation during this phase is formative—intended to form or improve the program (Bergquist, 1982). Judgments of skill acquisition are operationalized through the IEP and based on the *rate* of attainment of long-range goals and short-term objectives using various mastery criteria.

An important component of the IEP is the use of an evaluation system to assay the adequacy of attaining program objectives. This is operationalized through the use of aimlines and decision rules, translating the information in the IEP onto a graph. This graph then becomes a working document for the continual assessment of program effectiveness. Aimlines are visual illustrations of *estimated* or *predicted* performance/progress and indicate the general trend and direction that the data must take, based on the successful completion of progress/performance, as stated in the IEP long-range goal. Typically, the aimline is drawn connecting the student's baseline score with the level to be attained. Data are collected frequently (daily or weekly) and displayed on a graph to evaluate the effectiveness of alternative instructional strategies. Throughout the delivery of instruction, the decision to change the program follows a set of circumscribed decision rules. The effectiveness of any particular program is determined by comparing the student's performance/progress to the aimline. The decision rules then are used to help decide when to change a program that is not achieving the expected result.

Within this system, teaching is viewed as the process of testing various hypotheses. The assumption is made that a teacher does not know a-priori what will be an effective teaching strategy until it has been tried and evaluated. Continuous evaluation of instruction, using time series data, provides the teacher with feedback, allowing more effective program plans to be developed and less effective ones to be modified (Skiba, Marston, Wesson, Sevcik, & Deno, 1983).

Program certification. Two levels of decision making occur within this phase: (a) the individual level and (b) the system level. At the individual level, decisions regarding whether a program should be continued or terminated for a student are evaluated in terms of the reduction of the stated discrepancies

(meeting expected goals), the appropriateness of less restrictive alternatives, and the satisfaction of the referrer. Recommendations are made to those persons to whom future responsibilities have been assigned and are based on the data that have been collected throughout the program. At the system level, major administrative variables are reviewed in terms of the general direction of performance of groups of students on curriculum-based tasks. This level is appropriate for individual teachers, building principals, superintendants, and directors of special education. The focus of concern is on the organization of the entire program rather than on the individual student.

Summary. The Pine County Special Education Cooperative has developed and implemented a Total Special Education System that uses an integrated data-based evaluation system, that is continuous over time and across educational decisions. The system's major components include: (a) a formal and organized problem-solving system (Germann, 1983e); (b) a classification and service delivery system that emphasizes educational needs; (c) a measurement system that is direct and curriculum- or environmentally based, continuous, and locally norm referenced; and (d) outcome-based at both the individual and system level.

The remainder of this article will present two studies of the application of TSES procedures for assessing, developing and implementing, and evaluating program modifications for students with severe discrepancies. An overall discussion is provided to summarize the advantages of this approach and the cautions inherent in its use.

STUDY 1. CURRICULUM-BASED ASSESSMENT IN THE ACADEMIC DOMAIN

Based on an extensive amount of research that has been reviewed by others (cf. Deno article in this issue), academic measures were identified for the areas of reading, spelling, written expression, and math.

Reading. The measure in reading involves the student reading aloud for 1 minute from passages (randomly selected or in succession) from the basal curriculum and/or reading aloud for 1 minute from a list of vocabulary words selected at random from the basal curriculum. A count is made of the number of words read correctly and incorrectly (Deno, Mirkin, & Chiang, 1982).

Spelling. The measure in spelling involves dictation of a random selection of words from the basal spelling (or reading) curriculum for 2 minutes, counting either the number of words or letter sequences (White & Haring, 1981) spelled correctly and incorrectly (Deno, Mirkin, Lowry, & Kuehnle, 1980).

Written expression. The measure in written expression is a 3-minute writing sample in response to a story starter or topic sentence, with the count comprising the number of words or letters written or the number of words spelled correctly (Deno, Marston, & Mirkin, 1982).

Math. In math, 2-minute samples of computation problems appearing in the basal text are obtained for each function (addition, subtraction, multiplication, and division) and the numbers of digits computed correctly and incorrectly are calculated.

Overview of Academic Assessment Systems

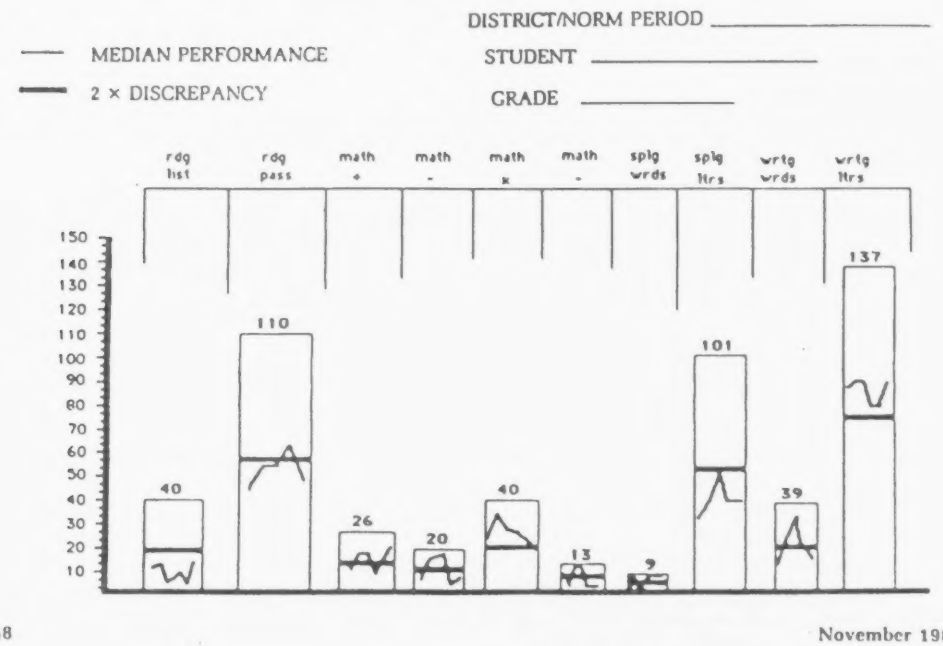
Problem selection. Measures of academic performance focus on the individual level of proficiency on curriculum-based tasks and include multiple samples of behavior over 3 to 5 days. For initial assessments, referred students are tested in all academic areas (for reassessments, only those areas are tested in which the student has received special education service). In the assessments, students are tested until a stable baseline level of performance is established, corresponding to approximately 5% to 10% variation across the measures (Sidman, 1960). The assessments are continued for at least 3 days, with further testing continued as needed. The data are summarized by calculating the median over the 3 to 5 days and compared to the normative performance levels of peers—the median performance of district students in the same grade as the target student. These district norms represent the desired rates for students, by grade level, for each academic area. They have been established by testing a group of randomly sampled students during the first weeks of school (fall), the first weeks of the second semester (winter) and the

last weeks of school (spring). Fall norms are used for all assessments conducted from the beginning of the school year until November 20; winter norms for all assessments conducted from November 20 until March 1; spring norms for all assessments conducted from March 1 until the end of the school year.

The comparison of assessed students to regular education cohorts is operationalized through calculation of a discrepancy ratio (Deno & Mirkin, 1977) by dividing the lower level of performance (usually obtained by referred/assessed students) into the higher level performance (usually the median peer performance). The resulting ratio is given a negative value, indicating the degree to which the referred student is lower than grade-appropriate peers. On occasion, the assessed student's performance is higher than the norms for grade-appropriate peers (i.e., if indeed the student is more skilled than others expected, or during the spring assessments, following a year of special education). When this occurs, the discrepancy ratio is computed by dividing the median peer performance *into* the performance obtained by the referred/assessed student. The resulting discrepancy ratio is given a positive sign, indicating superior performance of the assessed student over that of the student's regular education cohorts. Preliminary analyses indicate that this type of ratio is similar to other more accepted metrics (i.e., z-scores and percentage of the mean), in reflecting relative status of individual students (Tindal & Germann, 1985).

An academic assessment graph is shown in Figure 1. The data include normative levels of performance for all academic domains, summarized as the median at the top of each bar. The discrepancy corresponding to 2 times lower than peers has been demarcated as a heavy line separating the bar in half. This level represents the critical ratio for eligibility in Pine County. For students whose median performance is more than 2 times discrepant from that of peers, special education is considered a viable program option. In the data displayed in Figure 1, a student's performance has been recorded over 5 days for each of the academic areas. In only two areas, multiplication and writing (number of letters), is the median performance greater than the 2 times discrepancy level. This student would probably be found eligible for special education.

FIGURE 1
Academic Assessment Graph



Program planning. The development of program plans includes the establishment of an IEP, including a long-range goal and a short-term objective. At the time an IEP is developed, the program implementor establishes a basic measurement strategy to monitor student growth and documents both current and projected functioning in that material. Two alternative measurement options available for use by the special education teacher are performance and progress measurement. Performance measurement is designed to describe how a student's behavior changes on a constant task over time. This measurement system is predicated on the use of many parallel forms sampled from the same domain, which are repeatedly administered over time. Scores on these tasks are directly comparable to each other. The second strategy, progress measurement, involves monitoring student progress through a curriculum over a period of time in which a sequence of tasks/levels/objectives is established and a criterion of mastery is set for each task or objective. In this system, the repeated measures are less comparable, having been sampled from different domains, and therefore actual performance levels cannot be used for comparison. Rather, mastery of objectives is measured to monitor student progress. Consequently, performance and progress measurement are different in two essential ways: (a) in performance measurement, the stimulus materials are constantly sampled from the same pool, while in progress measurement, the stimulus materials change each time the student masters a segment of the curriculum; (b) in performance measurement, the goal is to improve the level of performance on one specific level of material, while in progress measurement, the object is to increase the rate of progress through a series of tasks.

Regardless of which type of system is implemented, an appropriate and sensitive measurement system must be established to develop a long-range goal that can be used in evaluating IEPs. The overriding concern is on developing a goal that can be attained within the school year and that succeeds in bringing the student to a less discrepant level of performance.

In a performance measurement system, the sampling plan defines the domain of items from which the tests will sample, resulting in a level of performance that is neither too low nor too high. If it is too low, the measurement task will need to be changed before the goal is reached. If it is too high, the measurement task may be too insensitive to document change in student performance. In a progress measurement system, the sampling plan defines the level of mastery and range of units in progressing through the curriculum. Here, the purpose is to establish a definition of mastery and range of levels of material in which the student may move from nonmastery at one end to mastery at the other end. In both systems, assessment data and age-grade appropriate peer performance are considered, using the district normative data.

In addition to establishing a measurement sampling plan, the IEP includes (a) determining current functioning and (b) projecting rate of improvement. Current functioning is determined by testing the student using the measurement materials initially considered appropriate. Often the assessment data can be used in determining an appropriate level of material for establishing an IEP, measuring current and estimated functioning. For example, performance scores from the initial assessment may indicate that the referred student is performing at a level comparable to students 3 years (grades) younger. The material from this grade would then be used to determine current functioning. In contrast, for students performing significantly below the level of peers (more than two times discrepant) but for whom such age-grade appropriate materials still appear adequate for incorporating into an IEP, no further testing may be necessary. That is, the assessment data may be used to document current functioning and the measurement materials incorporated into the annual goal. Only when it is determined that an adequate balance has been reached, representing an appropriate and sensitive measurement system, can the third and final step be accomplished—developing an appropriate goal and rate of improvement.

This last step simply involves calculating the difference between the projected or estimated level of performance (to be attained at the end of the year) and the current level of performance. When combined within the time frame for the annual review, this step provides the short-term objective.

Program evaluation. Once a measurement strategy has been determined and an appropriate IEP developed, including both a long-range goal and a short-term objective, a graph is

completed. This graph represents an exact duplicate of the IEP and, as such, contains all of the information contained in that document.

The emphasis within program evaluation is on developing empirically supported instructional programs. The initial program plan is treated as a "best guess" for the improvement of student performance. Following the establishment of this plan, student outcome data are generated on a frequent basis (ranging from daily to three times per week) and plotted on the graph. Then, concurrent with the implementation of the program plan, the data are reviewed, summarized, and evaluated to improve the program in a formative manner. Program evaluation focuses on making appropriate modifications, including decisions for the timing and content of program modification (Skiba, Marston, Wesson, Sevcik, & Deno, 1983).

Two systems are used in the timing of program modifications, with teachers deciding which one is most appropriate. In one system (White & Haring, 1981), a decision rule is implemented, specifying that whenever student performance falls below the aimline for 3 consecutive data days, the program should be changed. The emphasis is the eventual attainment of the overall program goal (i.e., long-range goal). In the second system (Mirkin, et al., 1981), the decision rule is based on the slope of student performance over a 7- to 10-day period. When the slope of improvement does not meet or exceed the slope of the aimline, programs are changed. An additional component to this decision rule, however, is that all programs should be changed after 3 weeks. The purpose of this strategy is not only to attain the program goals but also to experimentally compare programs to determine those that are optimal in effectiveness and efficiency.

An additional component to the evaluation of programs is the content of the modifications. This aspect is based on the work of Kazdin and Wilson (1978), in which one of four approaches is used to determine the most effective program, including (a) constructive, (b) dismantling, (c) parametric, and (d) package program analysis. In the first approach, the emphasis is on establishing an initially simple program that is systematically embellished, with effective components added over time. In the second approach, the focus is on systematically paring the program to the essential features that are most responsible for treatment effects. In the third approach, the components of the program are kept intact, but the dimensions surrounding their implementation (frequency, quantity, intensity, etc.) are systematically manipulated. In the final approach, entirely separate program packages are introduced, with no integration among them over time. Although this represents an idealized approach to program evaluation, teachers are trained to consider these strategies as they implement and evaluate instructional programs. Ideally, they are trained to be responsive not only to the timing of the changes, but also to the content of the change (Martin, 1982).

The methodology of evaluation in this system is firmly rooted in the single-subject methodology of the behavioral sciences (Hersen & Barlow, 1976; Kratochwill, 1978; Tawney & Gast, 1984). Although the experimental designs available within this paradigm are extensive, including variations of reversal and multiple baseline designs, most applications include primarily "ABCDE" designs (Fuchs, Deno, & Roettger, 1983) and multitreatment designs. As stated earlier, the focus of evaluation is the development of effective programs rather than the experimental corroboration of causation. In that sense, programs are systematically implemented, evaluated, and modified in an effort to improve student performance and attain the IEP goals.

Program certification. The use of a system such as TSES for program certification alleviates many of the problems encountered when using published achievement measures. The latter have been used in recent meta-analyses (Glass, 1976, 1977; Carlberg & Kavale, 1980) with results that lead to questions about effectiveness. Yet, their conclusions are problematic largely because of the evaluation system used (cf. Lakin, 1983; Tindal, 1985). What is needed to measure the outcomes of (special) educational interventions is a sensitive and relevant measurement system, such as direct measures of student achievement using curriculum-based assessment procedures (Deno & Mirkin, 1977; Haring & Lovitt, 1969; Howell & Kaplan, 1980; White & Haring, 1981). If our task is to measure the effectiveness of special education programs, it is imperative that the measures be specifically designed to measure pupil progress in the classroom.

The research presented here is a study of the degree to which students receiving special services improve when assessed with curriculum-based measures of achievement. It is our view that this alternative evaluation strategy may improve upon past analyses of the effectiveness of special education. It is important to note, however, that this research presents program evaluation rather than experimental research. The major difference lies in the experimental control exerted over the procedures. The emphasis is on the applied use of data in developing effective programs in the public schools.

Method

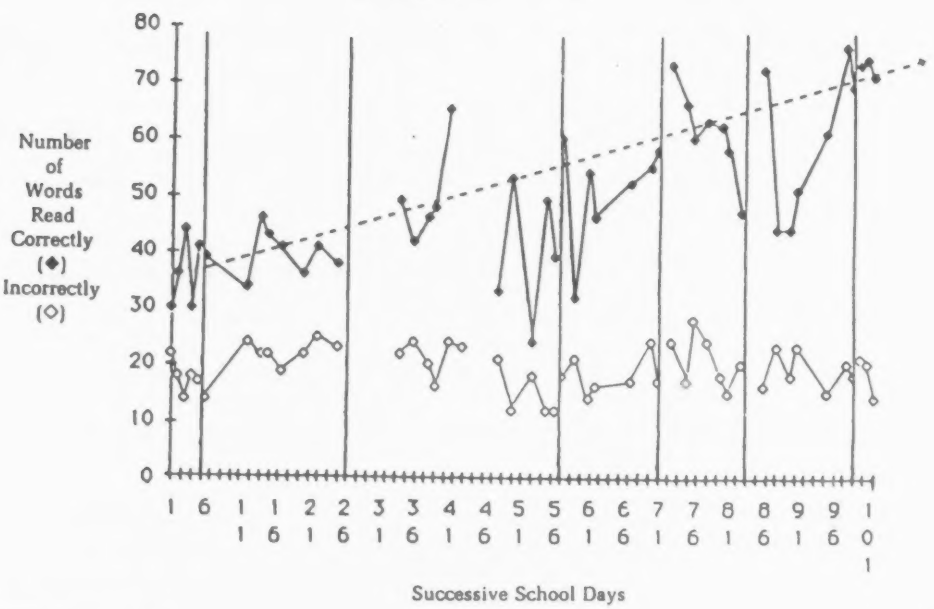
Data collection procedures in all academic areas (i.e., reading, spelling, writing, and mathematics) were routinely administered to all students once an IEP had been developed. As mentioned previously, a major component of the IEP is the measurement system for tracking student performance over time. This document specifies the item sampling procedure as well as the frequency of measurement. In the Pine County Special Education Cooperative, 156 students had IEPs developed in the area of reading across all 12 grades. Exemplary data at the individual level and systems level are summarized, analyzed, and presented in the results section.

Results

Results are reported for the student and system levels. In the student level analysis, two types of IEPs are reported: first a performance IEP and then a progress IEP. In the system analysis, performance is reported first for absolute improvement and then for relative improvement.

Student level reading performance IEP. The data presented in Figure 2 display the change in oral reading performance over a 6-month period. This fifth grade student was served in a resource room for reading 1 hour per day. The measurement materials included random samples of passages from long-range goal material (Level 5, Section 2 in the Scott-Foresman basal reading series, 1981 edition). In this particular IEP, the student was measured approximately 2 to 3 times per week.

FIGURE 2
Reading Performance IEP



The long-range goal of the program was to have the student reading 80 words correctly by the end of the school year (mid-May). A total of five different instructional program changes were implemented (as indicated by the vertical lines). These program changes involved manipulating several different features of instruction, including physical arrangement, time spent in instruction, materials, instructional strategies and presentation techniques, and type and format of motivational strategies.

Comparing the programs with each other, it appears that for two programs (the first and second), the rate of change in performance was negligible with a very flat slope. In contrast, using a measure of central tendency (median), some improvement was evident, with the median performance in baseline equal to 33 words read correctly; in the initial program, the median performance was 37, and in the second program the median was 45 words read correctly. However, the two programs differed considerably in the amount of variability of performance, which was considerably less in the first program than in the second. This variation in performance continued into the third program for the first 3 days, with the last 3 days of data indicating a trend toward increased reading proficiency, creating a noticeable upward trend for the program overall. Improvement is also reflected in the median level of performance, which was 51 words read correctly. This improvement was quickly abated with the fourth program change, which resulted in a very steep downward trend with nearly every day's performance less than the previous day. Although the initial step change in this program was fairly dramatic, after 3 days the level of performance was within the range of the previous program. This large step up and a subsequent slope down, nevertheless, resulted in an increase in the median level of performance, 59 words read correctly. The fifth program change resulted in a similar step up in performance, which did not stabilize. Rather, within the next measurement, performance was below the lowest level of the previous phase. After a break in the data, the last few measures in this program showed a very dramatic increase, representing some of the highest performance levels in the entire data array. However, the median level of performance actually decreased to 58 words read correctly. The last program change, which contains only the first three data points, indicates that student performance is continuing in a similar pattern to the previous program. Overall, it appears that this student will meet the predicted level of performance by the end of the school year. However, the program changes that were made have had dramatic consequences. Throughout the entire program, the rate of incorrect performance steadily decreased within successive program phases, although a comparison of the medians of the first and last program shows an increase of two words read incorrectly, from a median of 8 in the first program to a median of 10 in the last program.

Student level reading progress IEP. The graph presented in Figure 3 represents a 12th grade student's reading progress IEP for the academic year 1983–1984. The student was assigned to the resource room for 50 minutes each day, where he received small group and one-to-one instruction in both reading and spelling. The measurement system involved assessing the student's performance twice each week (on the average) in the same material used during instruction (SRA Corrective Reading, Level B). The data plotted on the graph represent the student's mastery of that material, defined as reading at a rate of 100 words correct per minute, with three or fewer errors and operationalized as mastering lessons in the curriculum. When a level of performance was attained equal to or exceeding the mastery level, the student was moved to the next unit in the series and the data point was plotted up one unit. For those days in which the student did not perform at the mastery level, the data point is plotted at the same level. The goal of this particular program was to have the student traverse 45 lessons during the school year. The student entered the program in lesson 10 (on October 31, 1983) and was measured for 61 consecutive school days (approximately 3 months). The educational program implemented for this student (within a small group arrangement) included the scripted lessons in the SRA materials, independent work involving silent reading using magazines and library books, and an assortment of worksheets. In addition, a formal point system was implemented, based on both classroom behavior and academic performance. As can be seen on the graph, no substantive program changes were implemented during the 3 months of the program.

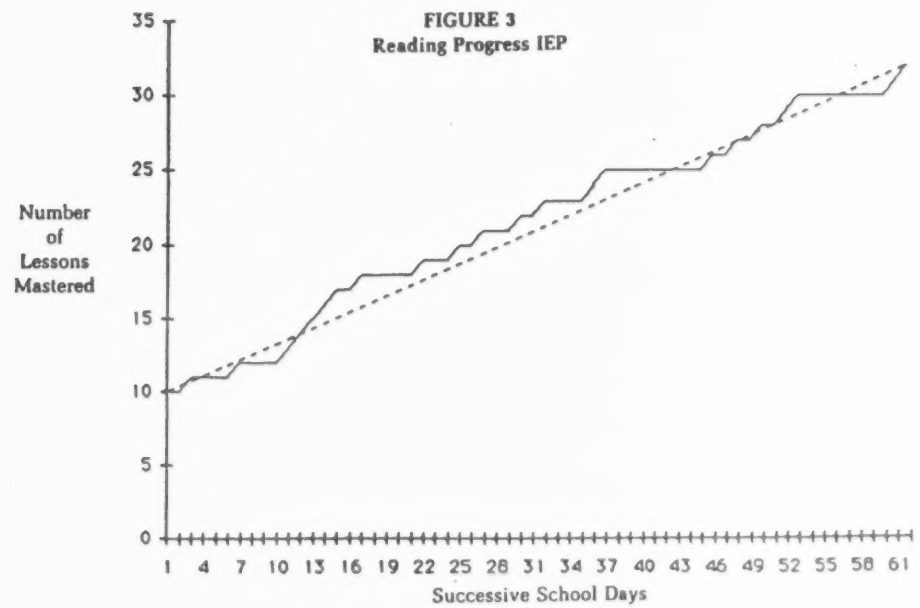
The analysis of these data cannot be as detailed as with the use of performance data since the use of slope, variability, median, and step changes are essentially irrelevant. The most meaningful statement that can be made with these data is that actual performance is in keeping with predicted performance (as defined by the aimline). While the rate of progress is initially less than that predicted, this changes very noticeably by the 10th measurement day. For a period of approximately 10 days, the rate of improvement actually exceeded the predicted rate. From the 21st to the 37th measurement day, the rate of progress was parallel to the predicted rate. This was followed by a period of no improvement (actually a result of Christmas break). Finally, progress is made similar to predicted performance, until another period of no change. This last break in the progression is confounded with the lack of measurement during a time when the teacher was involved in midyear assessments. In summary, it appears that the program was an effective one in moving the student through the curriculum and in achieving the goal of the program.

System level—absolute improvement. The data presented in Figure 4 summarize the aggregate performance of all students served with IEPs in each of the respective academic areas for each in reading ($n=156$), spelling ($n=49$), or writing ($n=42$) for each of three norming periods. Although several different measurement tasks typically are implemented in each of the academic areas, only the results from one task are presented here.

For all students with an IEP written and served for the full academic year, individual scores were aggregated to determine the overall level of performance. Only those students with an IEP in place by the December 1 child count were included in this aggregate analysis. Analysis was limited to this group because of concerns about the differing lengths of treatment for students accepted as eligible for special education following this date. That is, students served for 6 months (i.e., found eligible in mid-December) would be aggregated with students served for only 1 month (i.e., found eligible in mid-April). To provide an equal assessment of the effects of special education at all three time periods, only those students with complete data were included in this analysis.

In all three areas, students served in special education for 1 full academic year performed, on the average, at a higher level in the spring

FIGURE 3
Reading Progress IEP

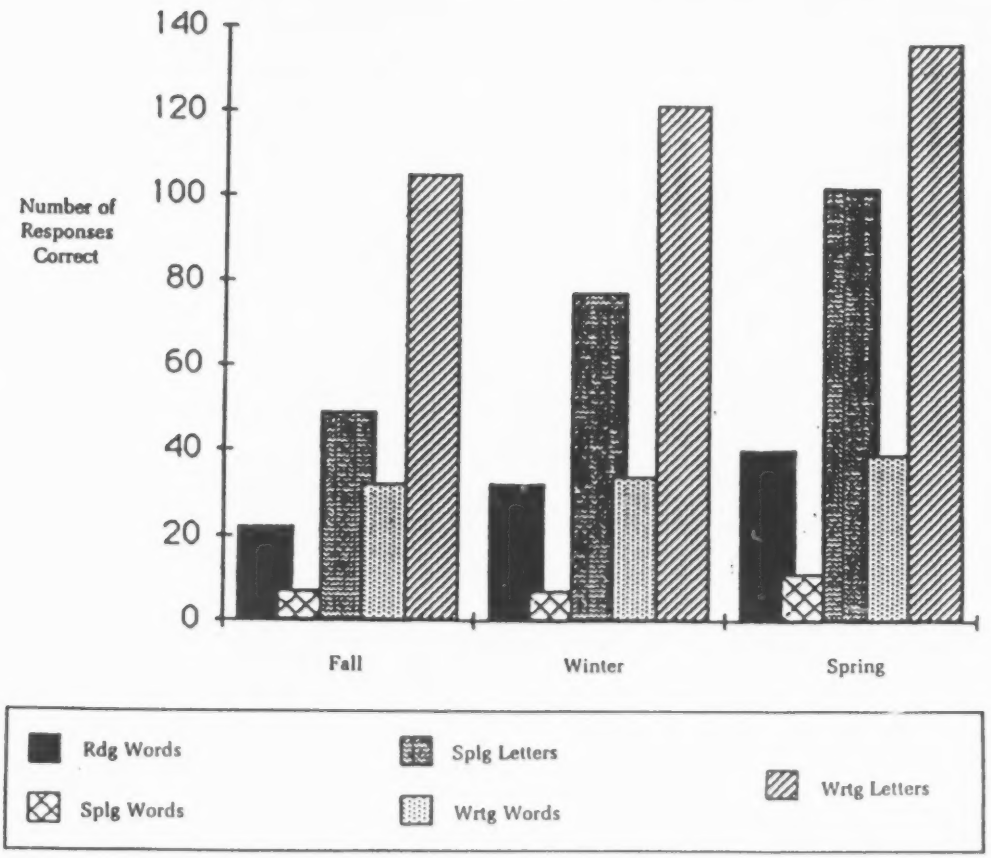


than in the fall. In the fall, the average reading rate of students was 22 words read correctly; in the winter, the rate was 32 words read correctly; and in the spring, the rate was 40 words read correctly. The amount of improvement appears to be well distributed among each of the three periods (from fall to winter and from winter to spring).

In spelling and written expression, the two areas scored for both words and letters, the changes are more obvious with letters than words. This change is probably quite similar when considered proportionate to the entry levels. In spelling, the average performance was 7 words spelled correctly in the fall (or 49 correct letter sequences). In the winter, the rate remained at 7 words correct, but the number of correct letter sequences increases to 77; and in the spring, 11 words were spelled correctly with 102 correct letter sequences. In written expression, the number of words written improved from 32 words in the fall to 34 in the winter, and to 39 in the spring. In contrast, the number of letters written moved from 105 in the fall, to 121 in the winter, to 136 in the spring.

System level—relative improvement. The data presented in Figure 5 depict the change in special education students relative to the change in their regular education cohorts. The graph has been constructed to show negative data, and improvement as an increasing (upward) trend. In all academic areas and with all

FIGURE 4
Aggregate Analysis of Absolute Improvement of Academic Performance



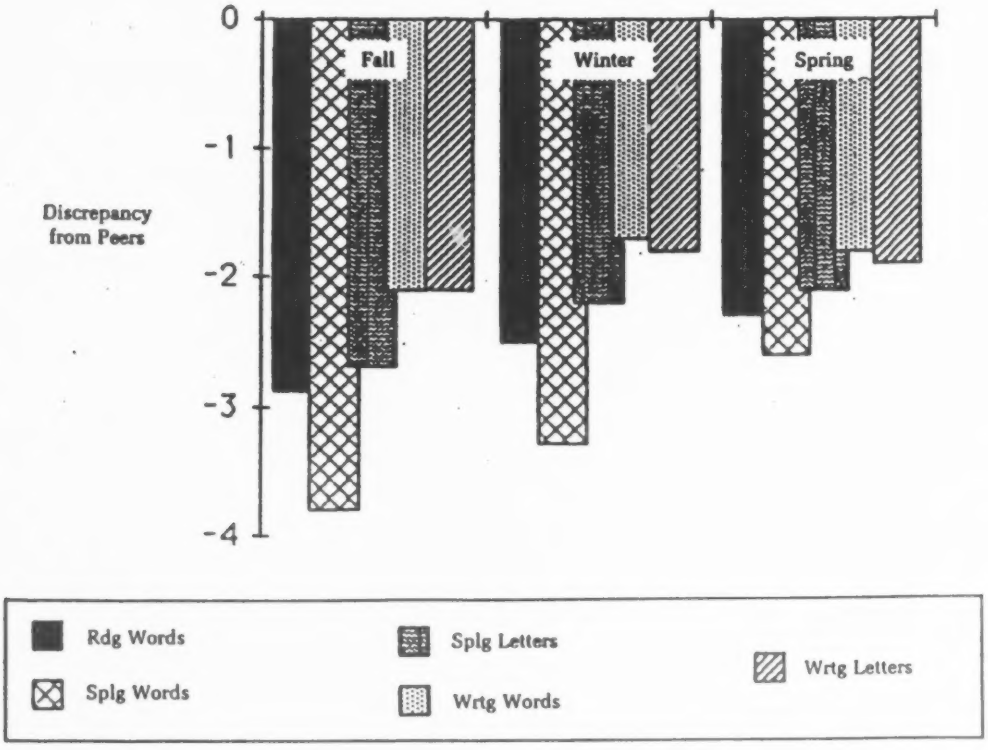
scoring procedures, students' relative performance improved during the course of the school year. With the exception of the written expression measures (both words and letters), all discrepancies improved from one testing period to the next. In this measure, the improvement noted from the fall to the winter is slightly more than from the winter to the spring.

In reading, the average discrepancy is −2.9 in the fall, −2.5 in the winter, and −2.3 in the spring. This discrepancy ratio corresponds to a t-score (mean of 50 and standard deviation of 10) of 35.4 in the fall, 35.1 in the winter, and 37.4 in the spring. Basically, the students served with an IEP in reading for 1 full year entered the program about three times discrepant from peers (performing at about a third of their level) or approximately 1.5 standard deviations from the mean. Over the year, their relative standing improved slightly.

In spelling, the discrepancy ratio was −2.7 in the fall, −2.2 in the winter, and −2.1 in the spring. The t-scores at these three time periods were 31.7 in the fall and 38 in both the winter and the spring. Again, the students served with an IEP in spelling for 1 full year were significantly behind their regular education counterparts upon entry into the program (about three times discrepant or nearly 2 standard deviations below the mean) but did improve in their relative standing during the year. Similar results were obtained for words spelled correctly, although the differences between the two groups were slightly more extreme.

In written expression, students were −2.1 times discrepant in the fall, −1.8 times discrepant in the winter, and −1.9 times discrepant in the spring. These discrepancies correspond to t-scores of 36.9 in the fall, 40.2 in the winter, and 41.7 in the spring. The data for the number of words written are also quite similar,

FIGURE 5
Aggregate Analysis of Relative Improvement of Academic Performance



though slightly less deviant from peers. Again, it appears that the average entry performance of students served with an IEP in written expression for 1 full year is about two times discrepant or nearly 1.5 standard deviations from the mean of peers, with some improvement noted by the end of the year.

Discussion

The data presented in Figures 2 through 5 indicate that special education programs are effective, at both the individual level and the system level. This finding is relevant for two important reasons. First, it is in stark contrast to the results recently reported by Carlberg and Kavale (1980) and several others (Johnson, 1962; Leinhardt & Palley, 1982; Sindelar & Deno, 1978). The research on special education effectiveness has had a short and unproductive history. Generally, the methodology has been extremely weak, with major threats to the internal validity of the findings (Tindal, 1985). Yet, the impression persists that the services provided to mildly handicapped students is weak and ineffectual (Glass, 1983).

Second, this finding is important because most research to date has been confined to a system level analysis, with most investigations using group design methodology. Yet, the nature of practice in the schools, in particular as mandated by law through the strictures of P.L. 94–142, is focused on the individual student level. This is effectively the only level at which programs can be developed and adjusted. The important issue is the formative evaluation of programs concurrent with their implementation. This means that not only are an adequate measurement and evaluation system needed, but also that the methodology of science must be introduced within the teaching profession, so that programs are designed, evaluated, and systematically manipulated.

While the system described in this study represents a model of evaluation with broad application, several cautions need to be addressed in interpreting the results. The most problematic issue involves the definition of effectiveness. In the data presented, effectiveness was operationalized as either improvement toward an IEP goal or performance more commensurate with that exhibited by peers. Yet, little is known about the quality of this definition. It is entirely possible for special education to be effective and not show such changes. In both cases, serious research needs to address the manner in which effectiveness is operationalized and evaluated. The data presented in this article represent but one system for defining and implementing a special education system that is attentive to student outcomes. It is neither exhaustive nor exclusive of other definitions. Finally, the system described in this study must be viewed as a process, not a product with fixed procedures and parameters. The relevant issue is that a special education program becomes established according to outcome data. Too many programs have been developed on the basis of input, with little analysis of the effects. In this analysis, it is student performance that is viewed as the ultimate criterion measure and the primary dependent variable for such evaluation. However, it must be again noted that the data presented here are in the context of program evaluation rather than experimental research.

STUDY 2. DIRECT AND REPEATED MEASUREMENT OF SOCIAL BEHAVIOR

In the Pine County Social Behavior Program, the major focus is on the behaviors of students as they interact within the educational environment. Thus, the definition of a social behavior problem is a statement of the actual behavior, the environmental demands and expectations, and the discrepancy that exists between the two. The problem is not something the child has; rather, it is something the child does or does not do that is discrepant from expectations. This approach is similar to the work described by Hersch and Walker (1983) in which classroom environments are described as comprising demands upon students that dictate socially acceptable behavior. The tolerance of the teacher for certain behaviors is implicit in this environmental expectation. Therefore, an emphasis on assessing and evaluating the student in interaction with his or her social and academic environments is necessary. The program assumes that the present educational environment to which the child is exposed is critical in influencing how and what the child learns and how the child behaves.

Further, it is posited that this environment can be used by the teacher to influence the student's behavior. The natural environments of the home and school are viewed as the best settings in which to deal with various prob-

lems of learning and adaptation. If the student is overly aggressive toward siblings at home, this problem behavior is best managed in the home. If the student is inattentive and is easily distracted, often off task, and fails to engage in academic endeavors in school, these behaviors should be managed in the instructional environment. If the student has difficulty getting along with peers, this problem should be managed in the school environment in the presence of peers. Programs that remove the child from these natural environments and place him or her in other less natural areas for treatment are deemed appropriate only in highly selected cases. In most instances, if appropriately structured, the natural environments contain the elements needed for appropriate behavior change.

The Pine County program is based on the premise that learning is more efficient when the environment emphasizes positive consequences of desired behavior. Excessive failure is inconsistent with the development of positive social behavior. A student cannot learn to interact in a positive manner with others in an environment in which "constructive" behavior is reinforced, within a social context that promotes excessive failure and provides primarily punishment. Frequent failure and punishment seldom contribute to positive behavior development and both impede learning and inhibit problem-solving behavior.

The goals of the social behavior modification program are to (a) assess and analyze behaviors deemed necessary for functioning in a less restrictive alternative; (b) place students in special educational settings as the result of the student's determined present repertoire of behaviors rather than of his or her diagnostic label; (c) whenever possible, deliver special education services to the student rather than bringing the student to the service (implying that social behavior program modifications should occur within the environment in which the problem exists); and (d) evaluate the success of social behavior program modifications on the basis of program improvement—the rate at which the program moves the student toward functioning in more normal environments and at levels of performance more commensurate with peers.

The Pine County program is based on the premise that the school must have the student demonstrate appropriate behavior that is acceptable to those comprising the child's social environment and not demonstrate inappropriate behaviors that are objectionable and interfere with fluent interpersonal functioning. The position is taken that students with social behavior discrepancies can become productive learners under appropriately designed environments. This means that students can learn to manage themselves, to make choices, and to assume responsibility for appropriate behavior. Students learn to be responsible for their own behavior as they are exposed to a wide variety of situations that provide frequent and clear feedback that their own behavior produces various positive or negative consequences.

Seven levels of special education services are descriptive of the services offered students who are in need of special education social behavior program modification. These seven levels represent a continuum of services available from the least restrictive alternative to the most restrictive alternative. In all levels, success is defined on the basis of mastery criteria appearing in the IEP and are therefore individually defined.

Service level I—Training in assessment and in-service on interventions. The primary emphasis at this level is on the prereferral assessment and intervention of behavior problems by regular education teachers in the classroom. The application of this level is through in-service training of groups of teachers in the general procedures, rather than individually in the context of a specific student behavior problem.

*Service levels II & III—Consultation agreement.*This level of service uses special education resources (teachers and psychologists) in consultation with regular education teachers in the classroom. A student is handicapped and eligible at this level when it is determined that the student meets one of the following standards: (a) the student's physical contact, noise, off-task, or out-of-place behavior is two or more times discrepant from the same grade/sex/setting peer median performance; (b) the student is less than two times discrepant in these areas, but the Student Support Team (SST) at the Eligibility Review Conference determines that the student is in need of services; or (c) the student has been receiving more restrictive services and the SST has determined that the student is eligible for less restrictive services since the student has met

the long-range goals at one of the more restrictive levels.

Service level IV—Supplemental aides. This level uses aides in the regular classroom, in addition to consultation services. Aides are used to conduct observations and implement programs in conjunction with the regular education teacher. Weekly meetings with the psychologist and special education teacher are also incorporated within this level. To be eligible for Level IV services, the following criteria apply: (a) Level II and III consultation agreements have been implemented and are not successful; (b) there is a discrepancy so severe the SST determines that the student needs management services before consultation services are attempted; or (c) a student has met the long-range goals for Level V, VI, or VII services and the SST determines that the student is eligible for services at a less restrictive level.

Service level V—Self-contained classrooms. This level is a self-contained classroom with a certified teacher and aide. To be eligible for Level V service, the following criteria apply: (a) Level IV services have been implemented and phasing out the aide has not been successful, (b) the SST determines that Level V services are needed, or (c) there is a discrepancy so severe that the SST determines that the student needs Level V services before either Level III or IV services have been implemented.

Service level VI—Homebound programs. This level involves homebound services in which educational programs are provided by an itinerent teacher. A student becomes eligible for Level VI services while awaiting placement for Level V or VII or when the county court or parents have rejected Level VII services.

Service level VII—Residential treatment. This final level is confined to residential treatment programs. A recommendation is made to the County Human Services Department (or if the student is an adjudicated delinquent, to the student's court services officer) that a student be placed in a residential treatment facility with on-grounds school when (a) Level V services have been implemented and are not successful or (b) there is a significant severe discrepancy accompanied by dangerous (life threatening), hostile, or beligerent behavior.

Dismissal. A recommendation is made to the district superintendent that dismissal proceedings be initiated for a student when one of the following conditions exist: (a) the County Human Services Department or county court has determined that the student should not be placed in residential treatment, (b) the student has not completed the program at the residential treatment facility in a satisfactory manner, or (c) the parents or student refuse placement at a residential treatment facility. When initiating dismissal proceedings, the school district follows the provisions of "The Minnesota Pupil Fair Dismissal Act of 1974."

In summary, the system is characterized by a full continuum of services, from mainstream prereferral training and intervention to the use of self-contained classrooms and residential treatment centers. In keeping with the philosophy of the program, all of these levels are fully utilized in delivering special education to students with behavior problems. However, the main levels involving the largest number of students are Levels II and III (consultation agreements).

Currently, the Pine County Special Education Cooperative engages school psychologists as the primary developers and implementors of the social behavior programs. Given the limited emphasis on assessment of intelligence, it is possible to use psychologists in a more functional role, in working with both students and teachers. Following referral, it is the psychologist who conducts the assessment, using both direct observation and interviews. While social behaviors may be defined in a myriad of ways, operational definitions have been confined to just four major areas, serving as vital signs for successful interactions within the classroom. The purpose of this limitation is to implement a common data collection system and intervention focus on those behaviors that are essential for success in the classroom. While it is not meant to be an exhaustive taxonomy of all possible (social) behaviors relevant to schools, it does highlight those that are critical for classrooms to operate smoothly and appropriately. The four major areas listed (and defined) in the following sections provide the "vital signs" of the social behavior program modifications in the Pine County Special Education system.

Noise. Any sounds created by the child that distract either another student or the teacher from the current work/activity. The noise may be generated vocally (including "talk outs" or

unintelligible sounds) or nonvocally ("tapping a pencil" or "snapping fingers").

Out of place. Any movement beyond either the explicitly or implicitly defined boundaries in which the child is allowed movement. If a child is seated at a desk, then movement of any sort out of the seat is "out of place."

Physical contact. Any contact with another person or that person's property that is unacceptable to that person. Kicking, hitting, pushing, tearing, breaking, and taking are categorized as physical contact or destruction.

Off task. Any movement off of a prescribed activity that does not fall into one of the three previously defined categories. "Looking around," "staring into space," "doodling," or any observable movement off the current task/activity at hand is included.

While these behaviors represent the major areas of assessment and intervention, a fifth area involving the lack of social behaviors (i.e., withdrawal and social isolation) is also considered on occasion. In contrast to the previously mentioned areas, which represent behavioral excesses, this area represents a behavioral deficit. Typically, this is an area that is more difficult to detect and of less concern to teachers. Nevertheless, it is included as a focus in Pine County and addressed whenever necessary.

Overview of Behavioral Assessment System

Problem selection. Actual performance is defined as the rate of behavior as measured by (a) direct observation over time by the case manager using interval recording for the behaviors of noise, off task, out of place, and physical contact and (b) a teacher observation system using momentary time sampling for all four behaviors (Sulzer-Azaroff & Mayer, 1977). The former is typically used in the initial assessment and weekly during program evaluation, while the latter is reserved for the evaluation of program effectiveness. In the initial assessments, an observation is conducted over several days for 20 to 30 minutes, with each session implemented at different times of the school day. The observation of the target student and his/her peers is systematically rotated at intervals of 1 minute. That is, the target student is observed for 1 minute (providing six 10-second intervals of data), then a randomly sampled same-sex peer is observed for 1 minute. This process is repeated (focusing on first the target and then a different peer) until the entire classroom has been sampled.

For each behavior, a discrepancy is calculated between the referred student's rates of behavior and the median of the student's peers' rates of behavior. In this assessment, the results of each behavior are kept separate (i.e., comparing noise only with noise) and a discrepancy computed by dividing the higher number by the lower number (typically the assessed student is divided by the classroom peers). This results in a number greater than 1.0 and indicates the number of times one level exceeds another. As in the academic domain, a negative sign is attached to the ratio, indicating the deficient levels of performance for the students assessed. For example, if a target student was observed to be out of seat for 40 intervals and the median level of this behavior for the student's peers was 12 intervals, the discrepancy ratio would be 40/12, or −3.3. This ratio could also be calculated as a percentage, given the number of total intervals observed.

Program planning. For those students deemed eligible for social behavior program modifications, a case manager (usually the psychologist) is appointed and an IEP is developed. The main purpose of this IEP is to provide a plan for evaluation of effective programs, including both a long-range goal and short-term objectives. The long-range goal is a behavioral statement of the case manager's expectations of the student by the end of a certain period and includes the three components typically noted for the IEP: (a) the conditions under which a behavior will occur, (b) a specific and well-defined behavior (using one or more of the four behaviors previously defined), and (c) the criterion for mastery. It is important to note that in this area the regular classroom (involving the classroom teacher, aide, or psychologist) represents the condition for most program modification prior to Level IV (self-contained classroom). Generally, the period for all behaviors is 8 to 10 weeks, allowing for quarterly (summative) evaluation. Severe, highly disruptive behavior typically uses shorter periods than less unacceptable behavior. The period for short-term objectives in assessing mastery criteria is usually a week.

For both long-term goals and short-term objectives the circumstances are the same and are written identically and as specific as possible without sacrificing flexibility. The mensurement systems are the same as those used in the initial assessment and in the same environment (i.e., class, period, location) in which the problem occurs. Typically, the median of peers' rate of behavior is used in establishing mastery criteria. Therefore, a decelerating aimline is noted on the IEP and plotted on the graph.

Program evaluation. The focus of program evaluation for social behaviors is on the development of an environment that not only accommodates the student in the least restrictive environment, but is also constructive in generating appropriate social skills, both with peers and with the teacher. This demands an analysis of both student behaviors and environmental demands. Information at this level of decision making is used not only to establish initial interventions, but also to direct the appropriate program changes. In the evaluation phase, psychologists serve as consultants to the regular and special education teachers, providing assistance in developing programs and interpreting their effects.

As in the previous decision areas, data are generated and evaluated at the level of the classroom. This represents the immediate environment within which successful functioning must ultimately be established. However, these classrooms are considered individually since they are comprised of students with different interaction patterns, teachers with different levels of management skills and resources, and unique problems presented by referred students. All of these aspects are considered in reviewing and modifying social behavior interventions.

As for academic behaviors, the evaluation is meant to be formative, providing a data base not only for validating the programs, but also for providing direction for their modification. Generally, the observation system for social behaviors involves a greater response cost than for academic behaviors. That is, the amount of time and personnel invested in the collection of data is considerably higher, precluding the same frequency of measurement as occurs in the academic domain. Once a program is established, the psychologists generally provide a weekly follow-up assessment, observing the student and interviewing the teacher. To supplement the amount of information available, emphasis is placed on training teachers and/or aides in appropriate data collection procedures. At times, this has involved using various observational systems (i.e., momentary time sampling) or collecting permanent products of the student's work.

An important part of evaluating individual programs is the movement of the student across different levels of service. While seven levels exist, primary emphasis is given to the use of Levels II through IV. Given the treatment of student problems within the mainstream environment, these levels correspond to the intensity of available supplementary resources. However, they are considered supplementary and not permanent features of the treatment program. After a cascade of services has been conceptualized as outlined by Reynolds and Birch (1982), students are moved to higher levels slowly, due to the ineffectiveness of current programs, and moved back into less restrictive services as quickly as possible. An emphasis on teacher training as well as on developing interventions aimed at remediating student difficulties is necessary for these movements. Ultimately, the result of social behavior program modification results in more appropriate student behavior and more skilled teachers.

Program certification. The emphasis on assessment and remediation within the mainstream environment provides a strong rationale for the need to evaluate programs at the system level. In this analysis, consideration needs to be given to program effectiveness as a whole and in relation to the allocation of resources and the development of programs by various personnel. Given the movement of students across levels of service and the emphasis on treatment in the least restrictive environment, it is imperative that the outcome data be used for structuring optimal and efficient services.

The two most important areas within the delivery of services at the system level relate to using consultation and training personnel. Following the referral of students and the subsequent assessment of current levels of performance, the emphasis of the initial program is on training teachers in implementing programs, with the psychologist serving as the consultant. Only with the lack of sufficient remedia-

tion is the student moved to the next level, in which aides are temporarily incorporated within the classroom. This level is usually temporary and serves only to bring the student under adequate control and provide a time for training the teacher in effective management strategies and/or rearranging the classroom environment to accommodate the student. While a self-contained classroom may eventually be warranted, the previous levels become important in reintegrating students into the mainstream classrooms. Program certification provides the necessary data to determine the number of students served and the outcomes at the various levels of service. Ideally, this information would be useful in developing a systematic in-service training program for the staff or provide for establishing supplementary services on a rotational basis.

Method

Student level. It is important to note that IEPs for off-task behavior in Pine County are never confined to this behavior alone. That is, for a student to have an IEP developed for off-task behavior, a discrepancy must also exist and a program modification must be developed for another behavior within the social behavior program. This stipulation was developed to avoid the many referrals addressing off-task behavior only. The student's behavior must present a problem for both the student and the class before consideration is given to assessment and special education programming.

The methodology for assessing social behavior problems involves the use of systematic observation (cf. Sulzer-Azaroff and Mayer, 1977 for a description of different observation systems). In this particular case, a 10-second (whole) interval recording system was employed. Prior to actually observing the student, the psychologist observed the classroom activities and made an anecdotal record of the general features and composition of the classroom. Then, on 5 separate days, the psychologist sat in the classroom and recorded student behavior for a minimum of 30 minutes. The time of the day was systematically varied across all 5 days to ensure a representative sample of the student's performance, unconfounded by any particular subject matter, content area, or activity present in the class.

During this observation, the psychologist observed both the target student and same sex peers. For each minute of observation of the target student (representing six 10-second intervals), a peer was selected randomly for observation for 1 minute. The next minute involved observing the target student again and then a different peer was sampled. Peers were observed systematically in rotation until all had been observed and then the sampling was reinstituted. At the end of the 30-minute period, an equal number of intervals existed for both the target student and the peers. The data then were converted to percentages, using the following formula: number of intervals off task divided by the total number of intervals.

After a stable baseline was established, an intervention program was developed. This involves direct implementation by the classroom teacher, with the psychologist serving as a consultant and resource person. In this particular case, the first intervention involved the student meeting daily with the psychologist to review appropriate classroom behavior. In the second program modification, the intervention involved implementing a token economy within the classroom environment. The teacher directly managed this system and reinforced on-task behavior with tokens, which were redeemable for free time twice each day. The third program change involved the use of a time-out chair. The teacher continued to use the token to reinforce on-task behavior, but upon observation of off-task behavior, moved the child to a chair in the back of the room for a 1-minute interval. The final vertical line represents a vacation period.

System level. Throughout the academic year, two psychologists served as the primary social behavior case managers. In this role they systematically collected data for all of the students served in Levels II through IV. On three occasions, data were summarized across students: in the fall, representing the median level of percentages of behavior for the month of November; in the winter, representing the median percentages of behavior for the month of February; and in the spring, representing the median percentages of behavior for the month of April. As in the academic area, only students served for the entire year were included in this analysis. In that regard, the cases summarized may be considered the most recalcitrant and the least likely to show positive effects. Many students were served for less

than one year but were not included in this analysis. Although the data for actual rates (percentages) of behavior will be reported, it is important to note that, in most of these cases, the level of service is concomitantly decreasing, as well as the actual rates (percentages) of (mis)behaviors. Altogether, 25 students were served for the entire academic year.

Results

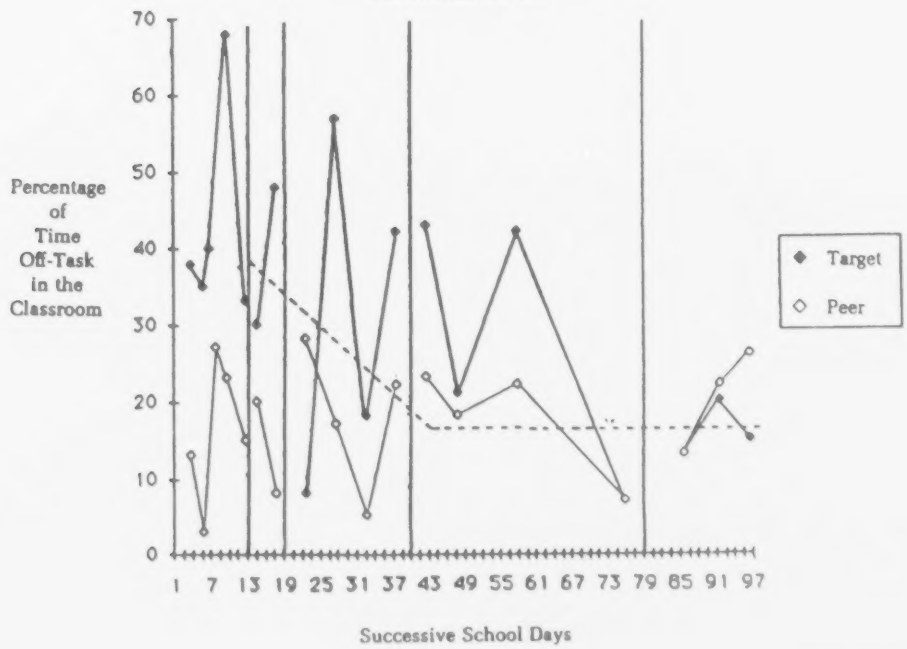
Student level. The data array displayed in Figure 6 cover a period from the middle of September to the middle of January, during the 1983–1984 academic year. It shows the results of a social behavior program modification (for off-task behavior) implemented for a second-grade student.

During baseline, conducted for 2 weeks, the student's median percentage of off-task behavior was 38%, with four data points between 30% and 40%, and one data point in which an extremely high value was found. This median value was 2.5 times discrepant from the rates of peers, who had a median of 15%.

During the first program, only two measurements were conducted. However, the data remained at a level consistent with baseline, representing a range of off-task behavior that was still very discrepant from peers. In fact, while the target student's levels increased, the levels shown by peers decreased to below 10%. The next program implemented (token economy) resulted in two fairly low days (below 20% off task), but also two high days (above 40%). The net effect was that little change occurred from the levels found in baseline. Given the variability of the data and a median level of 30%, a third program change (i.e., time-out chair in the classroom) was implemented. This modification showed no change initially, but over time it resulted in a level of off-task behavior below the level exhibited by peers. The last break in the data represents Christmas vacation. Following return to school, the level of behavior displayed by the target student remained below the level of peers. At this time, the psychologist discontinued monitoring the student.

System level. The data presented in Figure 7 include the averages of the 25 target students served within the social behavior program as

FIGURE 6
Social Behavior IEP



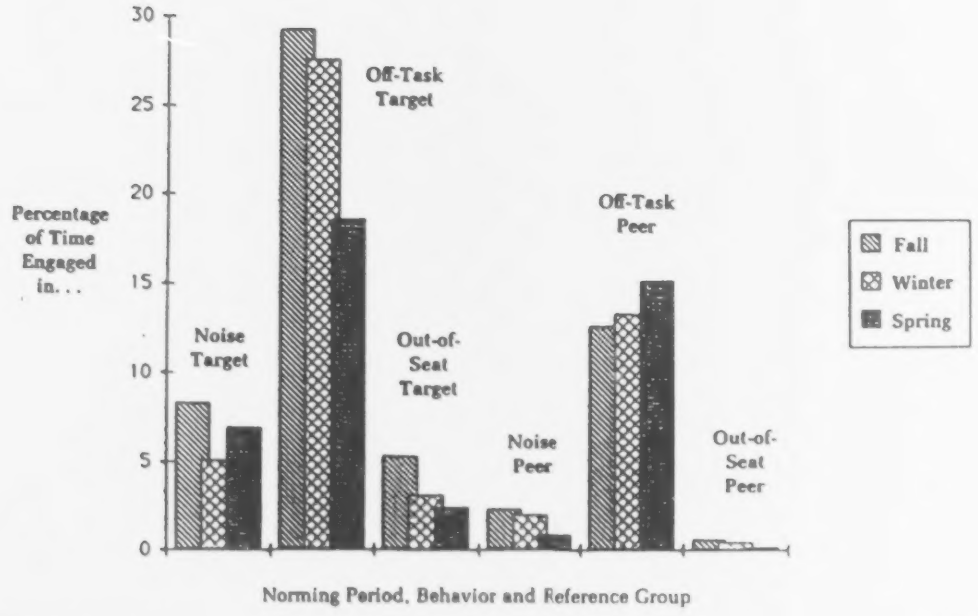
well as the averages of their classmates. Three different behaviors were recorded: noise, out of place, and off task. The data have been plotted together for each reference group, grouped according to behavior, with three time periods included: fall, winter, and spring.

For the target students, the percentages of (mis)behaviors decreased during the year. In both out-of-place and off-task behaviors, a steady decrease occurred from the fall to the winter to the spring. In noise, the overall percentages decreased, although improvement made initially from fall to winter was not maintained from winter to spring. The data for the classmates generally reflected the same changes. The actual levels of (mis)behavior were also substantially less than for the students served with social behavior modifications. In the area of off-task behavior, the average percentages actually increased from the fall to the spring.

Discussion

The purpose of this study is not to provide definitive support behind the use of token economies or time-out chairs in the treatment of social behavior problems, although a casual review of the *Journal of Applied Behavior Analysis* would certainly corroborate the usefulness of these two treatment programs. Rather, the main idea behind presenting these data is that social behavior problems need to be considered within the environment in which they occur. Furthermore, others in that environment need to be considered as an integral part of the treatment program. In the Pine County system, a full cascade of services is defined and operationalized for treating problems in this manner. For some behavior problems, consultation alone may be sufficient to arrange an environment to control the (mis)behaviors. In other instances, the temporary use of an aide may be necessary to develop appropriate contingencies. Finally, more intensive help from a psychologist may eventually be needed. All of these interventions represent attempts to treat the problems in the mainstream environment. There is no question that, on occasion, a self-contained setting may be considered the minimum treatment option. However, in relegating students to this level of

FIGURE 7
Aggregate Analysis of Social Behavior Outcomes



service, it is imperative that less restrictive services not only be implemented, but also that their effects be documented. One of the major problems with using this level of service is that no opportunity exists to display the relevant behaviors necessary for students to successfully function in the mainstream classroom. In that context, changes made in the treatment environment may not adequately represent the kind of performance necessary for students to successfully function in less restrictive environments.

Another value in the data generated at this level is the potential they provide for making general statements about classroom functioning. From the graph displayed in Figure 7, it can be seen that, generally, students are on task only about 85% of the time. By spring, little difference exists between students served and those not served in social behavior programs. Rather, the most noticeable distinction between them is in the level of more seriously deviant behavior—out of place and noise. It is likely that these behaviors are tolerated much less than simple off-task and inattention behaviors.

SUMMARY AND DISCUSSION

The purpose of this article was not only to review issues in the delivery of special education services to students exhibiting problems in the school, but also to present an integrated approach to the entire decision-making process. In the three studies reviewed, a measurement and evaluation system was employed that could assess student performance to make identification and eligibility decisions; to plan, implement, and evaluate instructional programs; and, finally, to document the effects of those programs on groups of students. In this effort, the concern has been on student performance in the classroom, focusing primarily on student achievement in the curriculum and successful interpersonal functioning with peers and teachers. Furthermore, the measurement system was organized to evaluate the effects of manipulating important variables in the delivery of instruction, such as the various administrative strategies considered, the kinds of materials presented to students, the full range of interactive teaching strategies used, and the consequences employed to reinforce correct and/or appropriate behavior. The emphasis, however, was on empirically verifying program effects within a single subject paradigm. Using direct and repeated measurement, programs were initiated and modified according to the effect on student performance, providing a truly individualized education program. Concurrently, the data base provided an analysis of the aggregate effects of entire programs at various administrative levels. Although the data presented were confined to the highest level of aggregation for all students in each of the programs, it is possible to break down the analysis to any appropriate level. In this system the consistency of the data base provides continuity within students over time (and decisions) and across students at one point in time.

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SECTION 3

MEASUREMENT COMPONENTS

The printed material in this section corresponds to the video module on the mechanics of measurement. These components include pinpointing, counting, recording, and charting. The printed material in this section is intended to augment the brief overview in the videotape with extensive material provided in the workshop.

III. A. MECHANICS OF MEASUREMENT -PINPOINTING

Section: Mechanics of Measurement
Length: Lecture - 15 Minutes
Activity - 45 Minutes
Method(s) of Presentation: Lecture
Activity - Simulation (By Teams)

Expected Concepts Learned:
1. Methods for selecting the behavior to be changed.
2. Application of concepts learned to a practice situation.

Materials: Facilitator Notes
Transparencies
Participant Worksheets (Envelopes containing worksheet)

Transparency
*5 Easy Steps
*Pinpoints

Transparency
*Components of a Pinpoint

Transparency
*"Selecting a Pinpoint"

A. Pinpointing/Sampling
1. 1st step to behavioral change and measurement of that change is to identify/isolate behavior that needs changing
2. Common problems
   a. selecting behavior
   b. defining behavior in observable terms
   c. slicing/pinpointing behavior into measurable/countable units, i.e. movements = behavioral events beginning, middle and end
3. Review case studies
   Brainstorm behaviors participants have identified for change.
4. Prioritize
   a. select relevant part of curriculum
      1) Don't leave workshop - go back w/what you saw.
      2) Assess student needs/deficits.
      3) Assess student motivators.
      4) Instruct to deficits/reinforce strengths
      5) Use your judgment - 1st month of placement.
   b. Choose most essential skills
      1) survival skills--What does a child need to survive? name, parents' names, address, phone #.
      2) putting on clothes.
      task analysis - no assistance, verbal cues, physical prompts, physical assistance.

3) tool skills - write # random. Say sounds/letters (Spell.). Write letters/words (Spell).

c. choose large chunks of the curriculum

1) common mistake - choose too small a slice.
--Especially a concern of special education
--Kids already are far behind
e.g., teacher has kids tracing 2's on dotted lines. See the student taking his time, smiling between each mark, off task, Asks student to write numbers 1-9. Can. Therefore task is not appropriate. Teacher was afraid she'd miss a step.
a) Add facts - is it a tendency to do +0-1'S, 2'S, 3's, Etc. - too small. Start add facts 0-18. Identify errors.
b) reading.
- do passage timings
- sounds M-A-F-S-E
- CVC Blending am. me, sam, fas, see, mass
- sight words - I, the
- passages

2) timings should reflect where you want to be at the end of a unit/objective/ terminal behavior.

3) identify a chunk to measure, a small piece to practice.
*Select the biggest possible chunk to measure & chart. Smaller slices of chunk timed daily practice - not counted/ charted. What may be a small piece/ practice to one may be a chunk to another.

d select a behavior to increase over one to decrease

5. Methods to select
a. analyze diagnostic data
b. do informal probes
c. screen
d. curriculum placement tests
e. achievement test scores
f. work samples

6. Defining a pinpoint
a. select a behavior--one that can be observed/measured.
Be precise
Writing: mechanics, grammar. thought units

Behavior: Giving compliments, following inst.

b. countable
--count digits to keep counting unit equal
e.g. long division 8 digits
1) counting unit sensitive enough to reflect growth
--spelling - letters/not words
E R U T M E T I C 7/2
A R U T H M E T I C 9/1
A R I T H M E T I C 10/0
Are shaping/approximating response.
--reading - wpm Has observable beginning and end so you and I can agree/count
2) Define terms - e.g. study skills
a) 9/10 Req. materials at beginning of class.
b) begin task W/IN 1 minute of directions.
c) on task - 85% etc.
d) follow. inst. - eye contact. say o.k., do immediately

c. fair pairs
--collect corrects/errors
appropriate/inappropriate

TRANSPARENCY
*Blank

Transparency
*Slicing the Skill

7. Slicing the skill:
a. review math column
1) WNR = warm-up activity/a tool skill
2) count bys = X 2's, X 3's, X 5's. etc. Then apply to problems (e.g., count by 7's; then do X 7 problems).
a) can be done during down times.
b) tickets in and out of room (5 minutes before recess, lunch, etc. Line up; count by 5's, 3's, etc. = ticket out. If student can't do, go to end of line. Same for alphabet, days of week, months, social skills steps).
3) pencil grip = warm-up tool skill.

Transparencies
*2 on pencil grip
*Learning Channels

8. Learning channels
a. concept: All students learn differently If they're not learning, change the channel.
b. Eric Houghton: We stifle creativity by limiting the channels used in our teaching - especially special education. Too often we use write or say as our only output channels.

EXAMPLE: S/S oral reading
S/T silent reading
H/W spelling/dictation
T/S alphabet/rote Counting

c. difficulty of a task can be modified by changing the learning channel.
d. enhances the generalization of skills:
H/T
S/T
S/T/D
S/D

Timing/Math S/S Double Digit Addition with carrying.
30" warm-up 30" activity
Discussion

D E M O N S T R A T E

ACTIVITY: SIMULATION

DIRECTIONS:

1. Physical arrangement--chairs and tables so that four people can work in small groups
2. Procedure
   a. Prepare envelopes prior to conducting the exercise. Each envelope should contain all four worksheets. By cutting off one end of the envelope, the title and number of each worksheet will be exposed. Participants can draw out one worksheet at a time without seeing the next one.
   b. Organize and seat participants by teams.
   c. Introduce the activity.
   "You each will be given a copy of the case study that you submitted prior to attending this workshop. As a team, select one of the case histories to use for this exercise. Put the other three aside for use later in the workshop.
   "With the selected student in mind, work with your team to complete a set of four worksheets. Make sure you complete one worksheet at a time. Do not move on to the next until you have completed the one you are working on."
   d. Hand out one envelope of worksheets to each team. Tell participants to take out only the first worksheet.
   e. Hand out case histories to their respective authors.
   f. Begin the exercise. Circulate during the exercise to answer questions as they arise. Advise teams to move on to the second worksheet is necessary.

g. Allow about 30 minutes or enough time for each team to complete all four worksheets.
h. Conduct discussion following completion of the of the worksheets by the teams.

EXPECTED CONCEPT(S) LEARNED:

Definition of a "specific/target behavior", i.e. pinpoint

MATERIALS:

1. To Be Duplicated:
   a. All pages marked "participant materials." Use the pages provided in the facilitators' manual as masters.
   b. An envelope for each team of participants that contains four worksheets. (Separate worksheets since two are printed on each page.)
   c. Copies of the "pre-workshop assignment" case studies submitted by each participant.
2. Other Materials:

I. STUDENT DESCRIPTION

In the space below, write a series of short statements that describe the student in your selected case study. Use whatever available information that you have on that student (e.g., easily distracted, I.Q. = 78, talks out in class, seldom initiates interaction, poor personal hygiene, etc.).

II. IDENTIFYING "SPECIFIC BEHAVIORS"

Refer to worksheet 1. Put a "B" in front of all statements that truly describe BEHAVIOR." Next add an "S" in front of those that are SPECIFIC enough that you can actually see change during the next month. List those behaviors below.

III. BEHAVIOR PINPOINTS

From your total list of "SPECIFIC BEHAVIORS," select three (3) in which you would like to see change in the next month.

IV. SELECTING THE PINPOINT

Pick one (1) of your behaviors that is OBSERVABLE AND COUNTABLE.

EXACTLY WHAT IS IT THAT YOU WILL BE WATCHING FOR?

III. B. MECHANICS OF MEASUREMENT -COUNTING/RECORDING

Section: Mechanics of Measurement
Length: 15 Minutes
Method(s) of Presentation: Lecture
Expected Concepts Learned:
1. Methods of counting and recording student behavior--academic, self-help, social, etc.
Materials: Facilitator Notes
Transparencies

B. Pinpointing/Sampling

Transparency
*List of Methods

1. Counting methods/records
   a. observe
      1) presence/absence of behavior = a checklist.
      2) extent of a behavior = a rating scale.
      3) anecdotal/analogue record = unanticipated behavior description.
      4) duration = length of time a behavior occurs.
      5) frequency = behaviors counted as they occur within a given time frame.

Transparency
*Frequency Observ. Record

   b. self-report = good for social behaviors
      1) presence/absence of behavior.
         a) self-concept inventories.
         b) focus of control.
      2) rating scales - goal attainment scales.
      3) anecdotal - journals.
      4) duration/frequency - record thoughts and feelings.
         e.g. is a technique for quitting, smoking, dieting.

Transparency
Countoons

   c. paper-pencil
      1) tests.
      2) worksheets.
      3) practice sheeets (p.t.).

III. C. MECHANICS OF MEASUREMENT - CHARTING

Section: Charting
Length:
Method(s) of Presentation:
Expected Concepts Learned:
Materials: Facilitator Notes
Transparencies

OUTLINE/NOTES	LECTURE
	1. Overview
	a. Review steps to measurement - highlight "chart"
Transparencies *5 Easy Steps to Measurement *The Chart Allows... *Objectives	1) objectives. a) to obtain an accurate measure of the rate of movement you have pinpointed. b) to display rates graphically so general trends and small change in rate can be observed. c) to permit evaluation of a student's learning during a course of study. d) to plan and make decisions that will improve teaching, learning, and/or curriculum construction.
	2) definition. a) pictoral/graphic representation of student performance. b) graphic representation of raw data (may be converted to percentages or collapsed). c) provides representative information over a period of time.
	3) permits general trends -- even smallest changes — to be observed.
Transparency *Function...	b. function 1) feedback. 2) prediction. 3) data synthesis. 4) interpretation. 5) bridge to decision-making. 6) communication. 7) comparability. a) across time. b) across students. 8) documentation - permanent record, easy to store.
	c. types of charts
Transparency *Progress Graph	1) progress: rate of student progress at mastering a set of instructional objectives encourages mastery learning. a) series of objectives - left side. b) time = points plotted sequentially across bottom (days, weeks, months).
Transparency *Equal Interval Chart	2) performance: how a student's behavior changes over time on a single task.

a) performance levels = left side.
b) time = across bottom.

d. characteristics
1) raw data collected.
a) at regular intervals.
b) in quantifiable terms.
c) in uniform segments/like methods.
2) graph.
a) time = horizontal axis.
b) rate/amount vertical axis.

e. procedure
1) decide on a plan/what will be recorded.
a) specified time (time-based).
b) certain # of movements regardless of time (movement-based).
2) observe/count behavior frequently.
3) count during same time period daily.
4) record raw data (count) = data collection.
5) chart.
6) use as a basis for decision-making.

f. summary/advantages
1) look at behavior.
2) demonstrates growth/lack of it.
3) predicts behavior before it occurs.
4) indicates when to move on/change intervention.

Transparency
*Blank

Turn to section on charting

Transparencies
*Primary Chart
*Practice Chart
*6-Cycle

2. Types of charts
a. primary chart
b. practice chart
c. standard behavior chart--designed by Ogden Lindsley
d. academic chart
1) one we use.
2) designed with bottom half reserved for raw data.

Transparency
*3-cycle

3. Standard behavior chart
a. overview
1) why blue?
a) research shows--blue is easier on the eyes.
b) don't xerox. will need an optometrist.
c) use 1/semester/subject/student.
2) why this kind of chart?
a) initially, everyone wanted to do p.t. using all kinds of charts. yielded no consistent information.

Transparency
*6-cycle chart

b) permits everyone to record in same manner.
c) standard--standardized because data the same wherever you are. whoever does it.

3) why not use equal intervals?
a) how many have charted? show of hands.
show = interval chart
used graph paper? 6-cycle?
b) chart of equal intervals would be huge--6½ ft. with same range (1x/min.-1000x/min.).
c) ratio by design can view in proportional growth (percentage of change) measures frequency--responses/min.

Demonstrate on 6-cycle transparency

d) if we chart entire class, some may be making tremendous growth. but are still at bottom of the class.

Transparency
*"Frequency"

Measure $\frac{\text{Performance + Growth}}{\text{Time}}$

Transparency
*"Bonnie & Clyde"

e) example of equal interval chart.
(1) who made most growth?
(2) looks like Clyde.
(3) plot on chart:
Bonnie - 9/10
Clyde - 90/100
(4) now who showed the most growth?
(a) equal intervals distort data.
(b) both are 10 percent.

Transparency
*Primary Chart

4) chart format.
a) bottom of page = credit lines.
(1) manager = teacher.
(2) agency = school.
(3) behaver = student.
(4) age = ca of student.
(5) label = grade.
(6) counted = curricular area.
b) other data.
(1) # across bottom = days (0-140).
(2) # across top = weeks (0-20).
(3) distance between #s along sides = movements (10 cycle = movement at a rate x 10). multiples of 10 = cycles. are equal and are 6 of them; thus 6-cycle. another name

Transparency
*6-cycle

= semi-logarithmic.

(4) # lower right side - will discuss later.

Transparency
*3-cycle

4. Why 3-cycle?
   a. typically aren't measuring in increments <1 and 1 or 2 timings are appropriate for most areas
   b. example of behavior = 2 outbursts in 20 min. rate/minute = .1; therefore need 6-cycle
   c. allows space for recording raw data (see bottom of page)

Demonstration
*on 3-cycle transparency

5. On the chart:
   a. day lines = vertical lines. each line is called a day line
   b. Sunday line = each heavy line. (if 1st semester, 1st Sun. line = Sunday date before the semester starts

Transparency
*Sync Dates

   c. calendar sync dates:
      1) see listing, page 11 of Training Manual.
      2) why sync dates? can compare data from different curricular areas, different teachers, different students.
      3) fill in dates across top of page.
      4) to locate specific days, count forward/backwards from Sunday day lines.

Transparency
*3-cycle

   d. Frequency lines/rate lines:
      1) horizontal counting lines.
      2) put finger on lines and count 1-10
      3) get to 10, then count 20, 30, 40 . 100 . 200 . . .1000 .
      4) figure out day and score for each entry.

Demonstration
*3-cycle

   e. Record floor:
      1) indicates length of timing.
      2) usually 1 minute.
      3) goes M-F beginning on week 2. skip Saturday and Sunday.
      4) draw in for each week you do timings.
      5) is what #s on lower right means.
   f. Raw data:
      1) across bottom.
      2) enter dates, corrects, errors, absences.

Demonstrate

      Wk. 8: 25/4 29/3 35/2 45/2 A
      Wk. 9: 45/4 53/5 A A 53/0

Demonstrate

   g. Phase line:
      1) specific skill you are going to work on (e.g. +0-18).
      2) use 1 color to indicate phase change lines.

2) use 1 color to indicate phase change lines.

Demonstrate

h. aim:
1) goal.
2) place the bar on the frequency line; the apex on the day.

"This is how your chart will look when you start."

i. learning opportunity:
1) error.
2) indicate with an X on intersection of day and frequency.

Demonstrate

wk. 12: 2/min. - Mon. 8/min. - Wed.
5/mn. - Tues. 1/min. - Thur.
0/Min. - Fri.
"Draw a new phase line, and I will give you a second set of data."

Activity

Timing
1 minute

"How many got <5? 5-10? 10-15? >15? in the classroom you'll do 1 dot/day/child--charting as you go."

j. phase lines:
1) start on ___ (record floor).
2) drawn ½ day before phase).
3) go to near top, turn right and run line parallel to top.
4) fill in the skill to be worked on.
a) major:
day change is to be worked on (e.g. new skill or practice sheet).
b) minor:
intervention. student remains in same curricular area. only record a special intervention. not routine strategies.

k. learning/best fit lines:
1) no longer looking at individual dots. looking at groups of dots.
2) collapse into learning lines - line of "best fit".

l. celeration: any movement
1) X celeration = celeration. times (X) is not multiplication. is corrects.
2) - celeration = errors, not divide.

Timing
2 Minute

"How many blanks can you fill in in 2 minutes? Skip ones you don't know."

"Pens in ready position. Please begin. Thank you. Cap pens."

Transparency
*Charting Conventions

Count corrects
Count errors

Timing

"Pencils in ready position. Please begin. Thank You."

"How many finished this time?" Participants call out responses.

Count each letter/symbol. Total/2 = # corrects/minute.
<20 corrects = acquisition
Proficient writers can respond at 80+/minute.

IV. B. TRANSFER - IMPLEMENTATION/GENERALIZATION
Section: Transfer
Length:
Method of Presentation:
Expected Concepts Learned:
Materials:

Transparency
*Management

1. Week 1 - set up
   a. select curricular area/target/pinpoints. Don't start too big
      1) suggest one pinpoint to start.
   OR 2) start with only a few students.
   b. acquire materials
      1) get practice sheets.
      2) get classroom materials.
         a) manilla folder.
         b) sponges.
         c) paper towels.
         d) pencils/pens.
         e) timing materials (digital timer).
         f) rulers.
         g) celeration finders.
   c. set up file system/student folders
      1) tape charts securely to outside of folders - easier to see; won't get messy.
      2) could use 2 folders - 1 for chart and 1 for timings or tape acetate over chart to keep it clean.
2. Weeks 2 & 3: train/organize
   a. plan for student management
      1) passing out/collecting materials--folders, sponges, etc.

2) starting, stopping, rewinding tapes.

b. train students to count, record, and chart

c. train cross-age tutors
   1) for younger students.
   2) for less able students.
   3) for oral (see/say) work.

Transparency
*Rationale

d. rationale
   1) become more responsible for own learning.
   2) learn important charting and graphing skills.
   3) are motivated and develop positive attitudes.
   4) learn to estimate.
   5) learn days of week, months, time concepts.
   6) build rate on fine motor skills.
   7) saves time!!!

3. Week 4: Decision-making

a. conduct daily timings
   1) establish set time daily.
   2) establish daily routine for management tasks.
   3) time timings and management tasks in order to determine where to cut time.

b. decide how often monitoring will occur
   1) preferably daily.

OR
   2) at least weekly - on Fridays or Mondays. 5 days flat data is better than 4 months.
   3) it takes less time to check one set of charts than to check one set of papers. (may make 4 changes on Friday, may make 16).
   4) don't make changes before a timing.

c. teach decision-making to students
   1) visually display and teach the following decision-making rules to students:
      a) at aim 2 out of 3 days.
      b) 3 days flat data.
      c) learning lines = <1.25.
   2) using the pencil method, teach students on a weekly basis to continue or change.
   3) ask students to place folders in a box when done.
      a) attach a red flag with brads.
      b) turn up flag if they need help.
   4) have students record data. observe teacher do charting. will learn from that.

WORKSHEET 1

(TO ACCOMPANY VIDEOTAPE)

SEGMENT #1

PINPOINT: _____

METHOD: OBSERVATION SELF-REPORT PAPER-PENCIL

TYPE: PRE-/POST- PRODUCT PROCESS

DATA RECORD (SEE ATTACHED RECORD): _____

SCHEDULE: DAILY WEEKLY MONTHLY

CHART (DOCUMENT): TABLE BAR GRAPH EQUAL INTERVAL CHART
LOGARITHMIC CHART

SEGMENT #2

PINPOINT: _____

METHOD: OBSERVATION SELF-REPORT PAPER-PENCIL

TYPE: PRE-/POST- PRODUCT PROCESS

DATA RECORD (SEE ATTACHED RECORD): _____

SCHEDULE: DAILY WEEKLY MONTHLY

CHART (DOCUMENT): TABLE BAR GRAPH EQUAL INTERVAL CHART
LOGARITHMIC CHART

SEGMENT #3

PINPOINT: _____

METHOD: OBSERVATION SELF-REPORT PAPER-PENCIL

TYPE: PRE-/POST- PRODUCT PROCESS

DATA RECORD (SEE ATTACHED RECORD): _____

_____

SCHEDULE: DAILY WEEKLY MONTHLY

CHART (DOCUMENT): TABLE BAR GRAPH EQUAL INTERVAL CHART
LOGARITHMIC CHART

SEGMENT #4

PINPOINT: _____

METHOD: OBSERVATION SELF-REPORT PAPER-PENCIL

TYPE: PRE-/POST- PRODUCT PROCESS

DATA RECORD (SEE ATTACHED RECORD): _____

_____

SCHEDULE: DAILY WEEKLY MONTHLY

CHART (DOCUMENT): TABLE BAR GRAPH EQUAL INTERVAL CHART
LOGARITHMIC CHART

WORKSHEET 2

Referring to the behavior pinpointed for change on worksheet #1, develop an IEP and evaluation plan.

I. LIST TOOL SKILLS/PRE-REQUISITE SKILLS

II. GOAL STATEMENT

A. When _____ What _____ Criteria _____

B. Skills Involved in Reaching Goal:

III. OBJECTIVES (FROM OBJECTIVE TABLE)

IV. STRATEGIES/MATERIALS

A. Learning Channels (student)

1. Input/stimulus

___see
___hear
___think
___point
___touch
___other (specify)
_____

2. Output/response

___think
___write
___say
___mark
___do
___other (specify)
_____

B. File: INST. PROG.
Report: TABLE

OBJ #	MATERIALS	LEARNING CHANNEL	QUANTITY	FREQUENCY	METH OF MEAS	DOCUMENTATION

OBJECTIVE TABLE

	QUESTION ANSWERED	EXAMPLES OF COMPONENT	YOUR STATEMENT
WHEN	WHEN do I want to see the desired change in the student?	• by March 15 • by the end of 2nd semester • after 10 class sessions	
WHO	WHO is going to make sure the objective statement is carried out?	• teacher • teacher associate • parent • principal	
WHAT	WHAT behavior will the student be able to perform?	• read • say • compute • spell • name • discriminate • write • point	
TO WHOM	TO WHOM does the objective pertain?	• Mary/Joe • student • pupil	
CONDITION	UNDER WHAT CONDITION(S) will the behavior be performed?	W = without assistance V = verbal cues G = gestural cues X = cooperative/joint venture	
CRITERIA	What level will constitute success?	• 60 percent • all • at least 25 • 3 times/opportunity	
EVALUATION	How will the EVALUATION be done to determine if criteria were met?	• frequency chart • work samples • systematic observation • weekly test	

DATA RECORDS

A. PRE-/POST-

1. Test Scores
2. Skill Checklists/Task Analysis Checklists
3. Progress Measure Graphs
4. Rating Scales

B. PRODUCT

1. Analogue Observation (e.g.. performance in role play groups)
2. Archival Records

C. PROCESS

1. Frequency

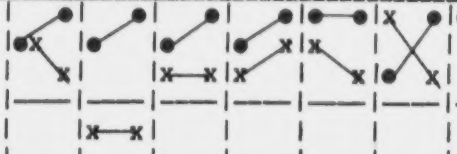
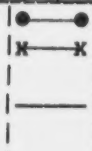
    a. point systems
    b. systematic observation
    c. daily timings/charts
    d. self-recording

2. Duration (systematic observation)

WEEKLY DECISION LOG

NAME: _____

(Check Your Picture and Suggest a Decision)

PINPOINT	DATE/WEEK	Improving	Main-taining	Worsening	Decision
		 other		other	

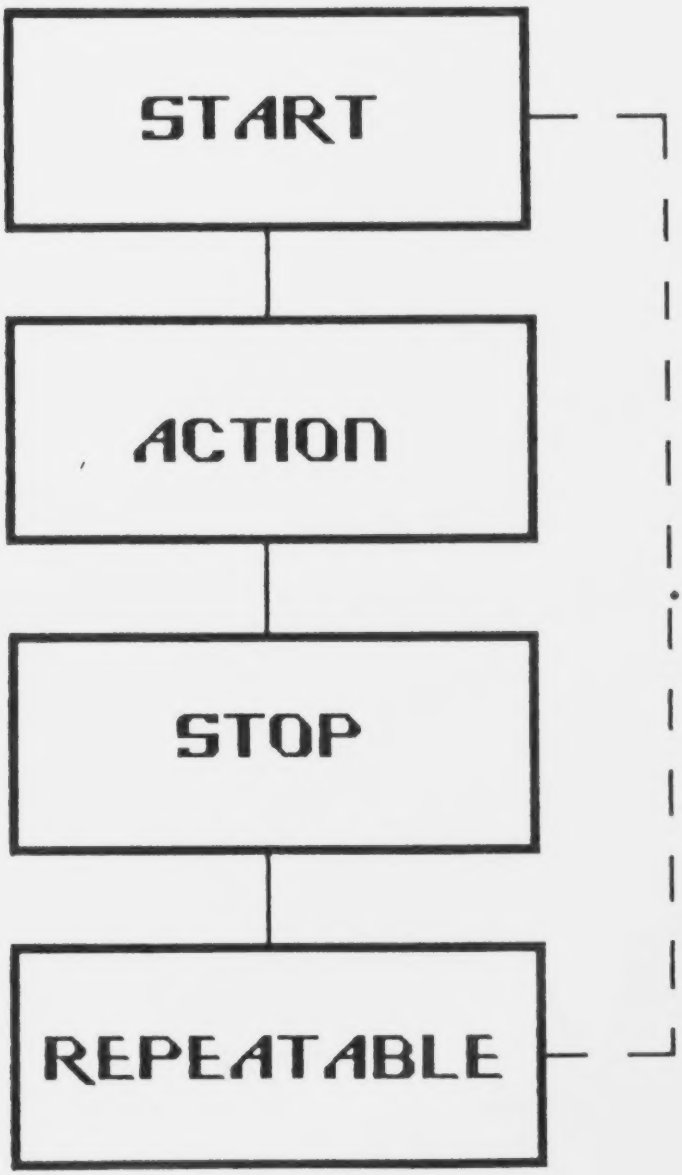
5 EASY STEPS TO MEASURMENT

- ☐ PINPOINT
- ☐ COUNT
- ☐ CHART
- ☐ AIM
- ☐ EVALUATE/DECIDE

PINPOINTS

BEFORE YOU START TO CHART, OR EVEN DECIDE TO CHART, THE FIRST STEP IS TO CHOOSE A PINPOINT, IN OTHER WORDS, EXACTLY WHAT IS IT THAT YOU WANT TO MEASURE AND IMPROVE? WHAT ONE THING ARE YOU MOST CONCERNED ABOUT?

COMPONENTS OF A PINPOINT



SELECTING A PINPOINT

CHOOSING A PINPOINT

- Relevant part of the curriculum
- Most essential skills
- Large chunks of curriculum

  ...identified as end-of-unit goals

  ...identified as terminal goals, e.g. S/S passages rather than isolated words

  ...will last long enough to make measurement worthwhile

- Note: Smaller slices may be timed daily practices which are not necessarily charted.

DEFINING A PINPOINT

- Precise

  ...pinpoints specific target behavior, not general category

  ...describes specific action, i.e. the learning channel

  ...describes outcome, e.g. the academic skill

  ...is consistent - each instance represents the same amount of behavior, e.g. in spelling count letters rather than words

- Countable

  ...has an observable beginning and end

  ...is repeatable

- Fair Pair

  ...collect both correct and error data

  ...count appropriate and inappropriate behavior

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SLICING SKILLS

LEVEL

1. Inventory of Screening Level (probe)
2. Concept Level (probe)
3. Skill Level (slice)
4. Item Level (slice)

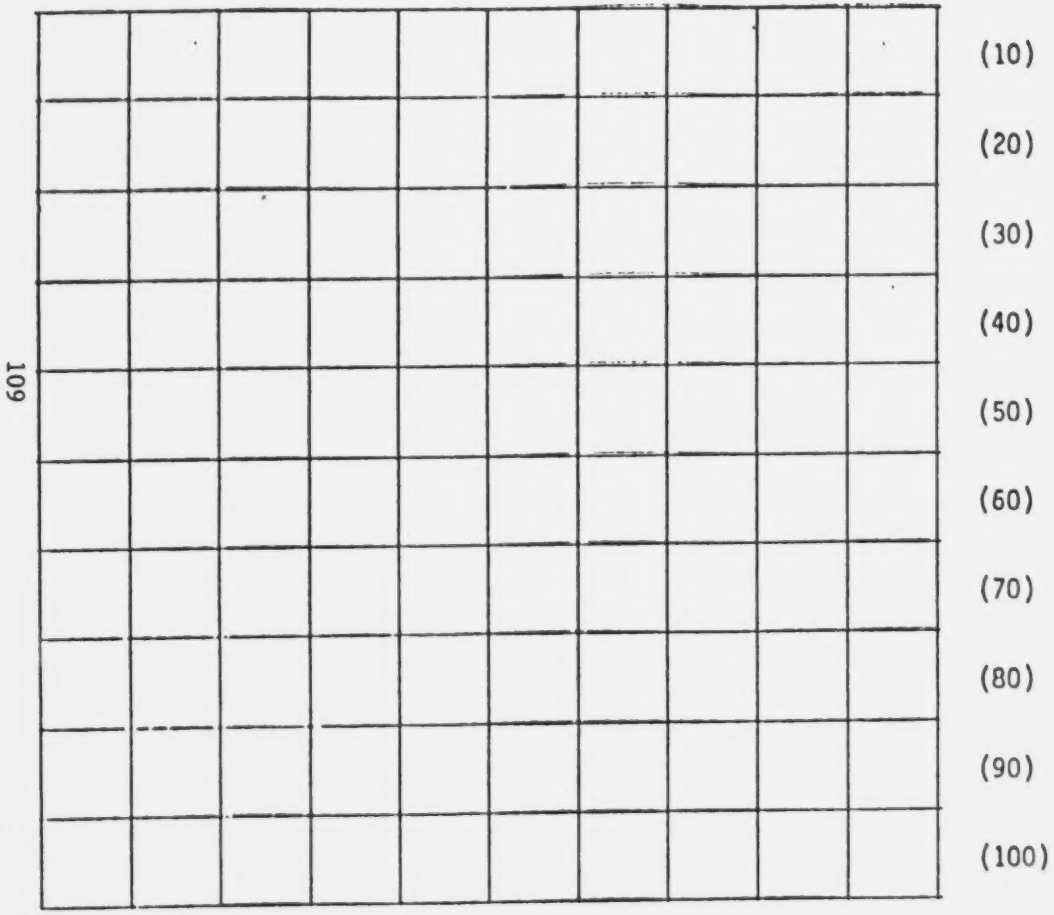
TOOL SKILL

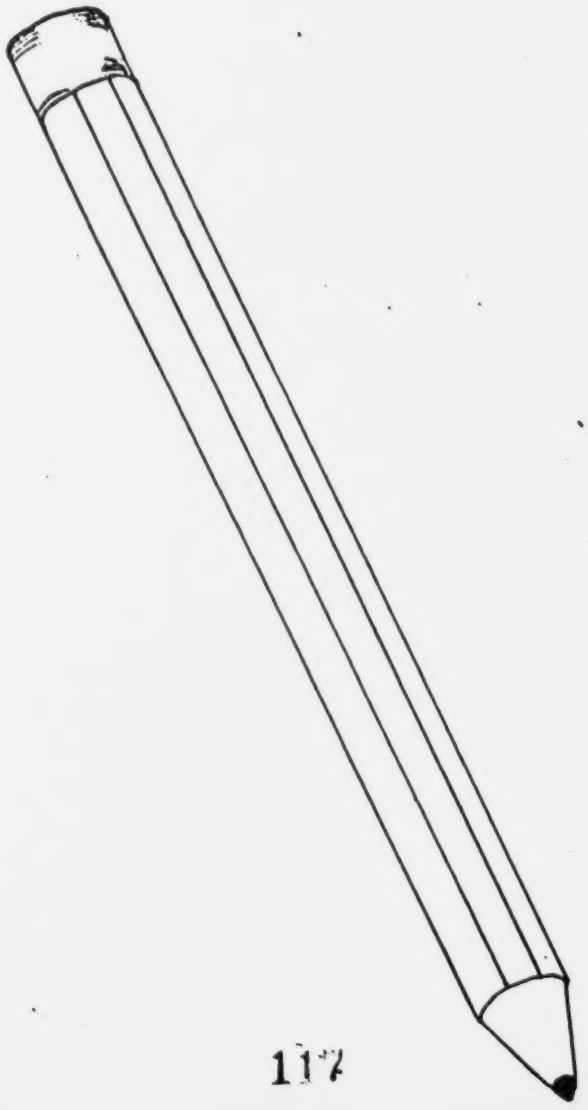
Motor

Conceptual

NAME_____ DATE_____ COUNT: CORRECT_____ ERROR_____

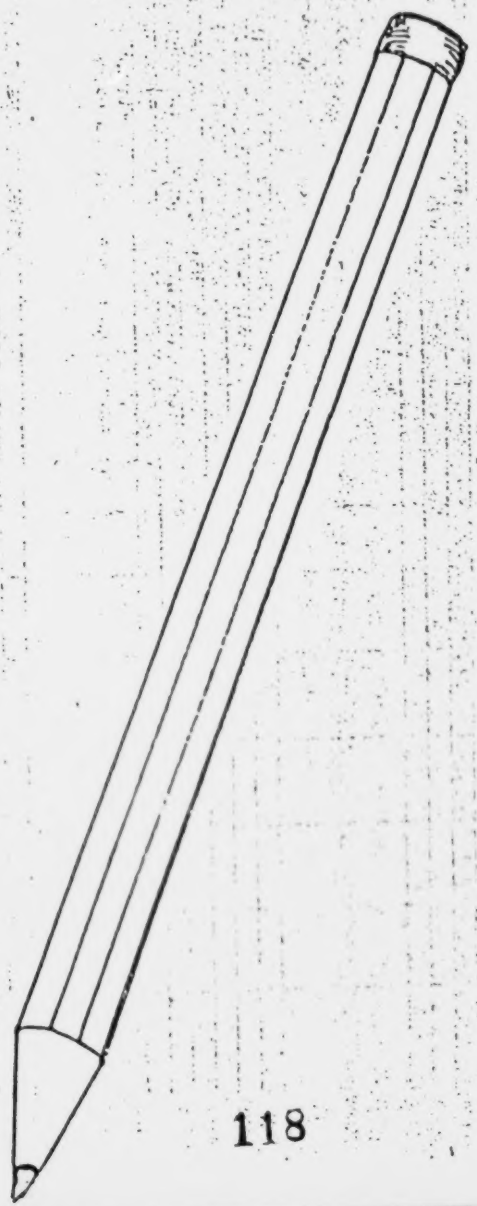
THINK/DO/MARK: Right Hand





NAME_____ DATE_____ COUNT: CORRECT_____ ERROR_____

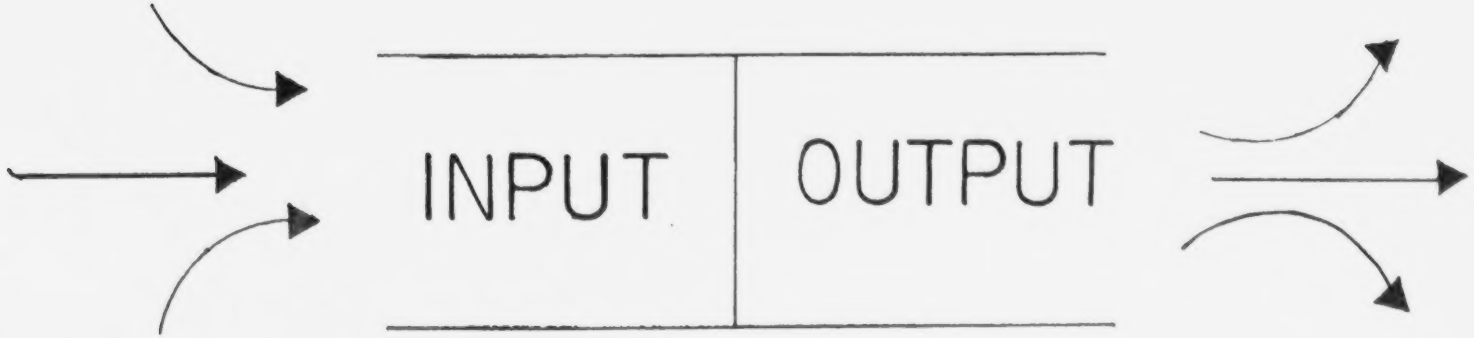
THINK/DO/MARK: Left Hand



110

									(10)
									(20)
									(30)
									(40)
									(50)
									(60)
									(70)
									(80)
									(90)
									(100)

LEARNING CHANNELS



INPUT	OUTPUT
SEE	THINK
HEAR	WRITE
THINK	SAY
POINT	MARK
TOUCH	DO

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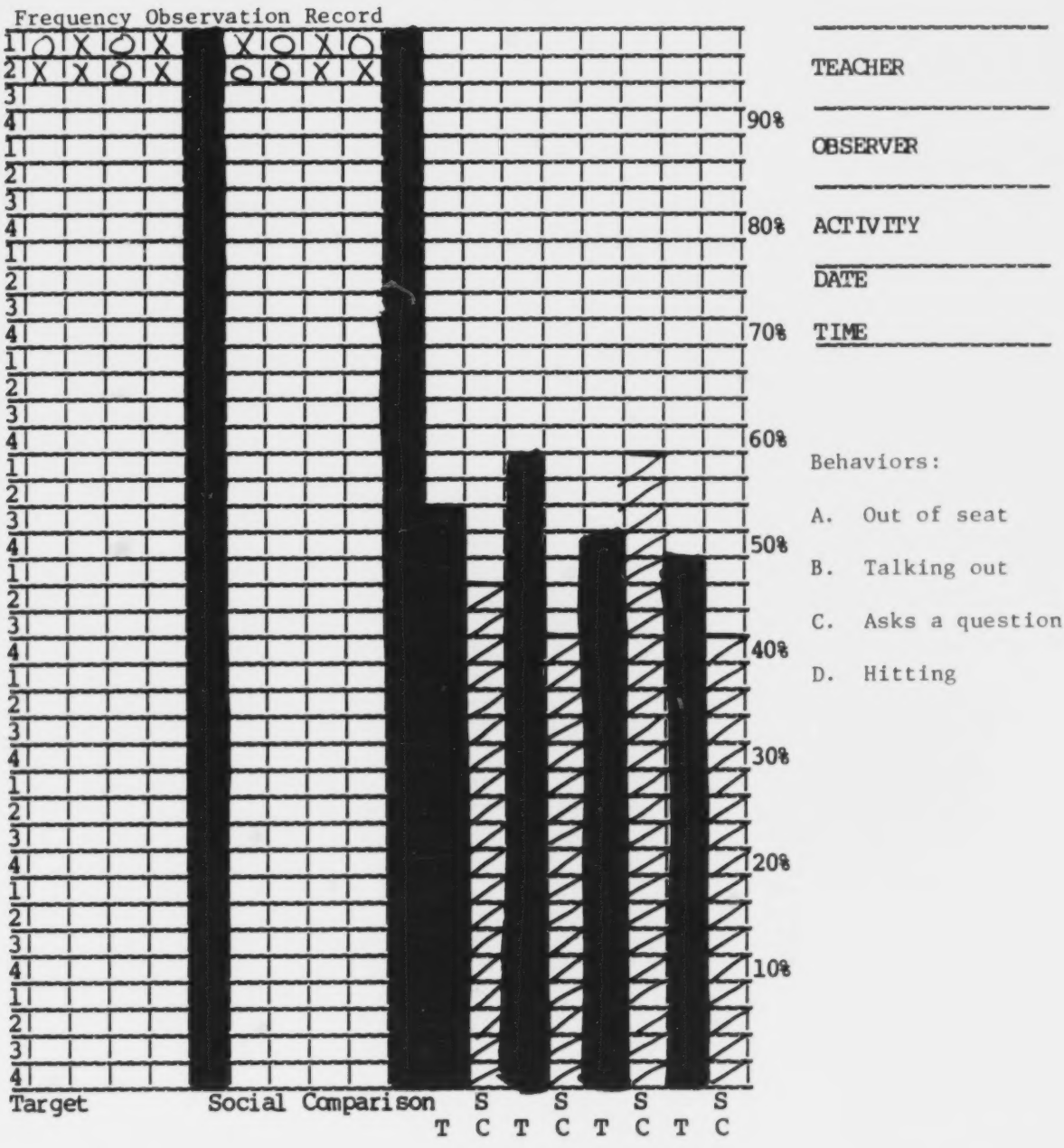
- OBSERVE
- SELF-REPORT
- PAPER-PENCIL


Frequency Observation Record
90%
80%
70%
60%
50%
40%
30%
20%
10%
Target
Social Comparison
S T
S C
S T
S C
S T
S C
S T
S C
TEACHER
OBSERVER
ACTIVITY
DATE
TIME
Behaviors:
A. Out of seat
B. Talking out
C. Asks a question
D. Hitting

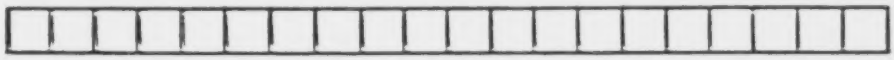
Frequency Observation Record

pupil _____

task _____

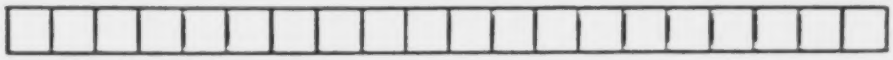
mo da yr ___%

mo da yr ___%

mo da yr  ___%

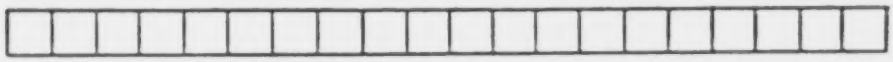
mo da yr ___%

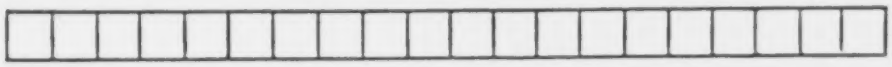
mo da yr ___%

mo da yr  ___%

mo da yr ___%

mo da yr ___%

mo da yr  ___%

mo da yr  ___%

total ____%

Frequency Observation Record

NAME: Bobby P. SEX: M D.O.B.: 1-2-7

DATE OF OBSERVATION: 1-10-86

OBJECTIVE: To decrease aggressive behaviors

OBSERVATION:

SUBJECT	DURATION			FREQUENCY	ΣF	BASE RATE
	START	END	TIME			

TYPE OF BEHAVIOR: ____ DEFICIT X INTERFERING

DESCRIPTION OF BEHAVIOR: Hitting peers

Free play	10:15	10:35	20'	HH	5	.25/min.
" "						

TYPE OF BEHAVIOR: ____ DEFICIT X INTERFERING

DESCRIPTION OF BEHAVIOR: Pinching other students peers

Art	11:00	11:30	30'	HH 1111	9	.3/min.

TYPE OF BEHAVIOR: X DEFICIT ____ INTERFERING

DESCRIPTION OF BEHAVIOR: accepting criticism

Math	1:00	1:40	40'	11	2	.05/min.

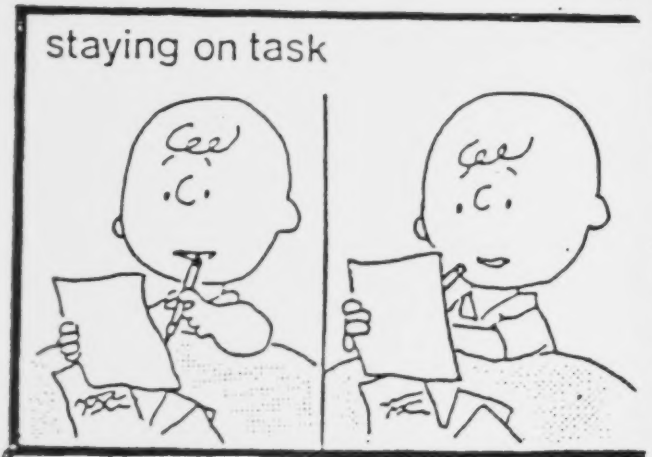
TYPE OF BEHAVIOR: ____ DEFICIT ____ INTERFERING

DESCRIPTION OF BEHAVIOR: ____

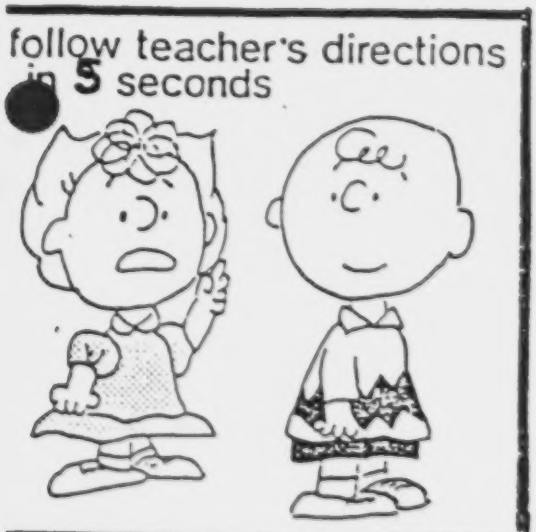
WARC [illegible] PARUSAN

X 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10

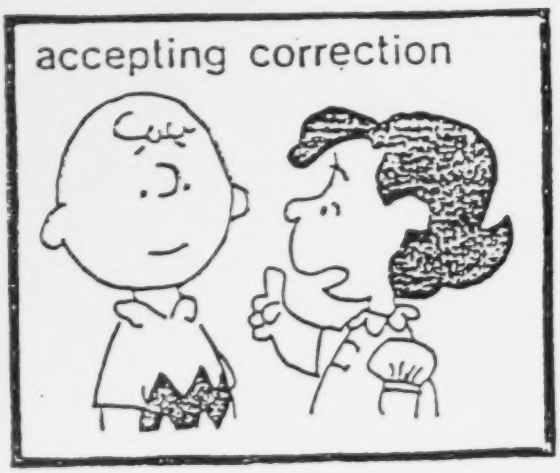
O



1 2 3 4 5 6 7 8 9 10 11 12 13 14
1 2 3 4 5 6 7 8 9 10 11 12 13 14



✓ 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10



1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10

126

The CHART allows you to:

1. See the past
2. Understand the present
3. Predict the future

J, Samuels

CHARTING OBJECTIVES

ACCURATE MEASUREMENT

GRAPHIC DISPLAYS

EVALUATION OF STUDENT LEARNING

DECISION-MAKING

CHARTING PROVIDES A PICTORIAL/ GRAPHIC REPRESENTATION OF STUDENT PERFORMANCE OVER TIME -- PERMITTING EVEN THE SMALLEST CHANGES TO BE OBSERVED.

FUNCTION

FEEDBACK

PREDICTION

DATA SYNTHESIS

INTERPRETATION

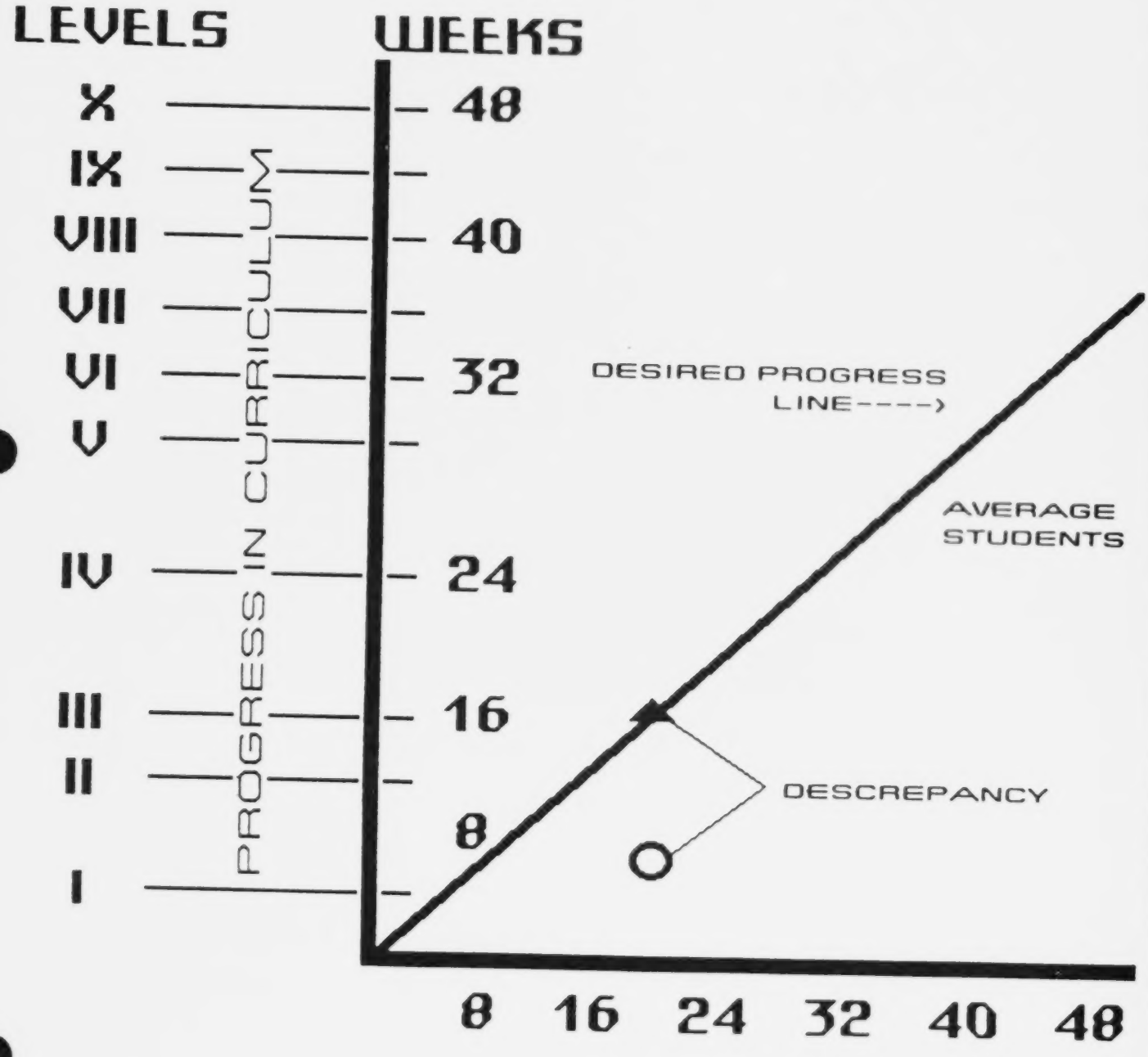
BRIDGE TO DECISION-MAKING

COMMUNICATION

COMPARABILITY

DOCUMENTATION

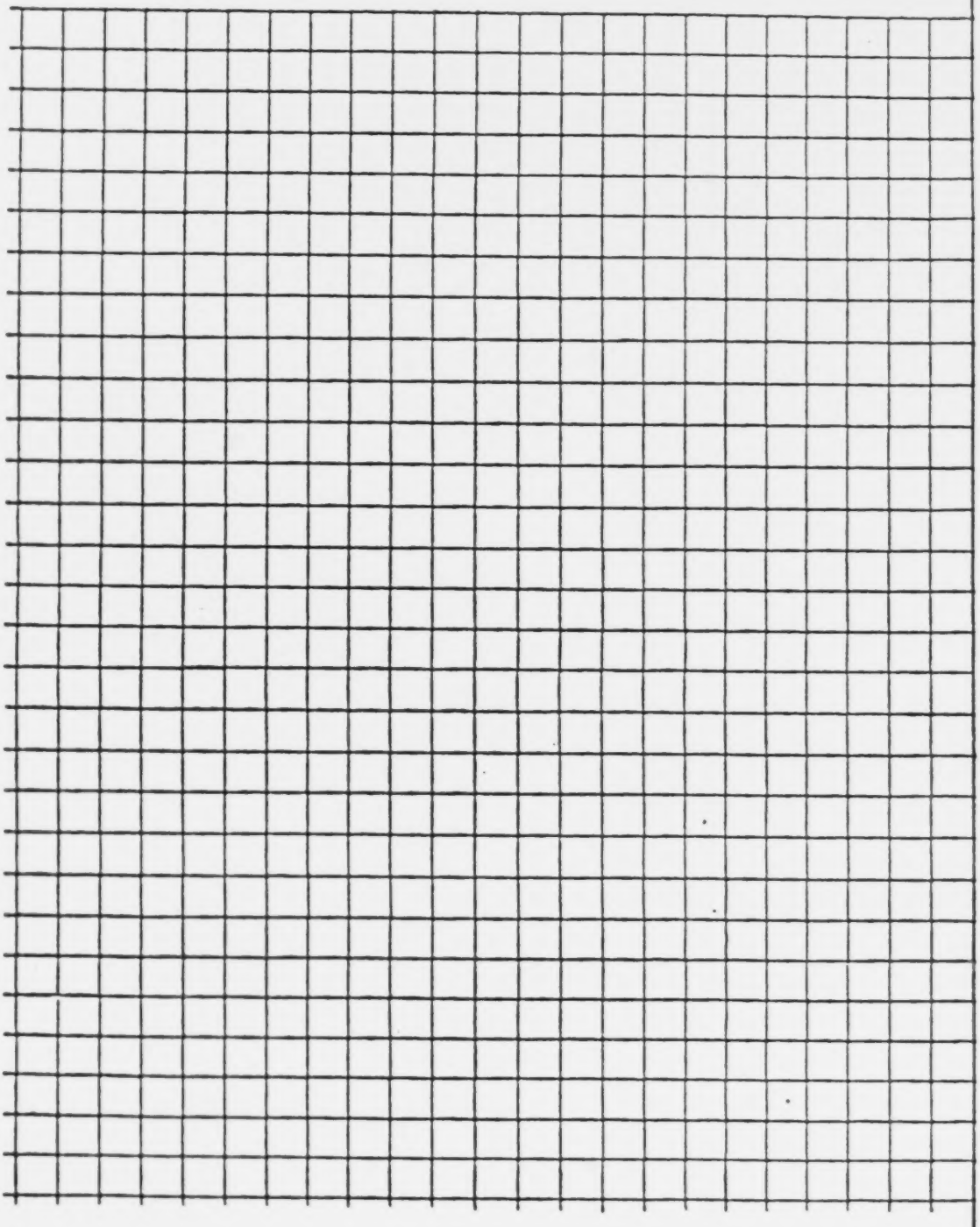
PROGRESS GRAPH



DATE _____

NUMBER OF _____ FOR _____

NUMBER OF _____



DAYS 131

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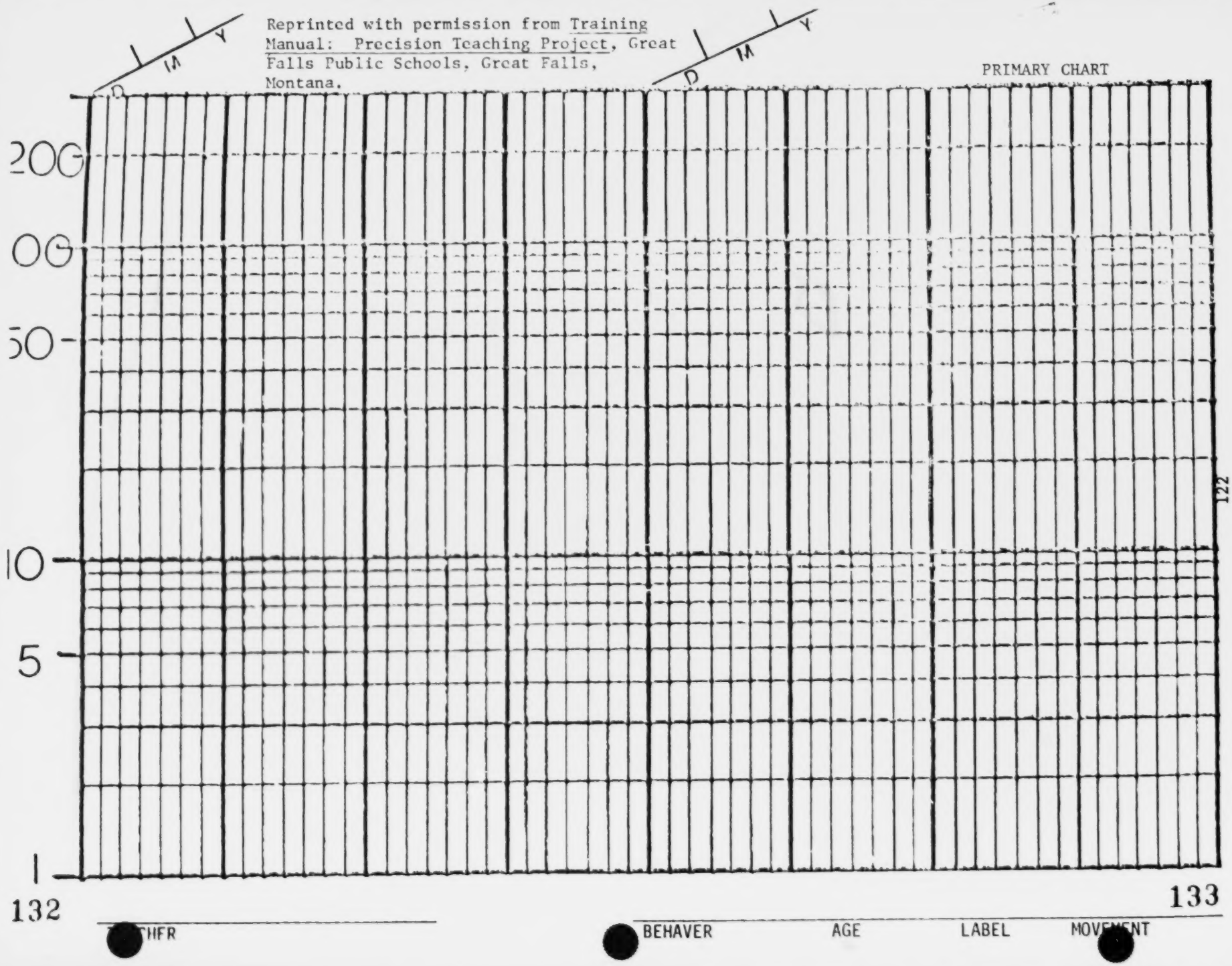
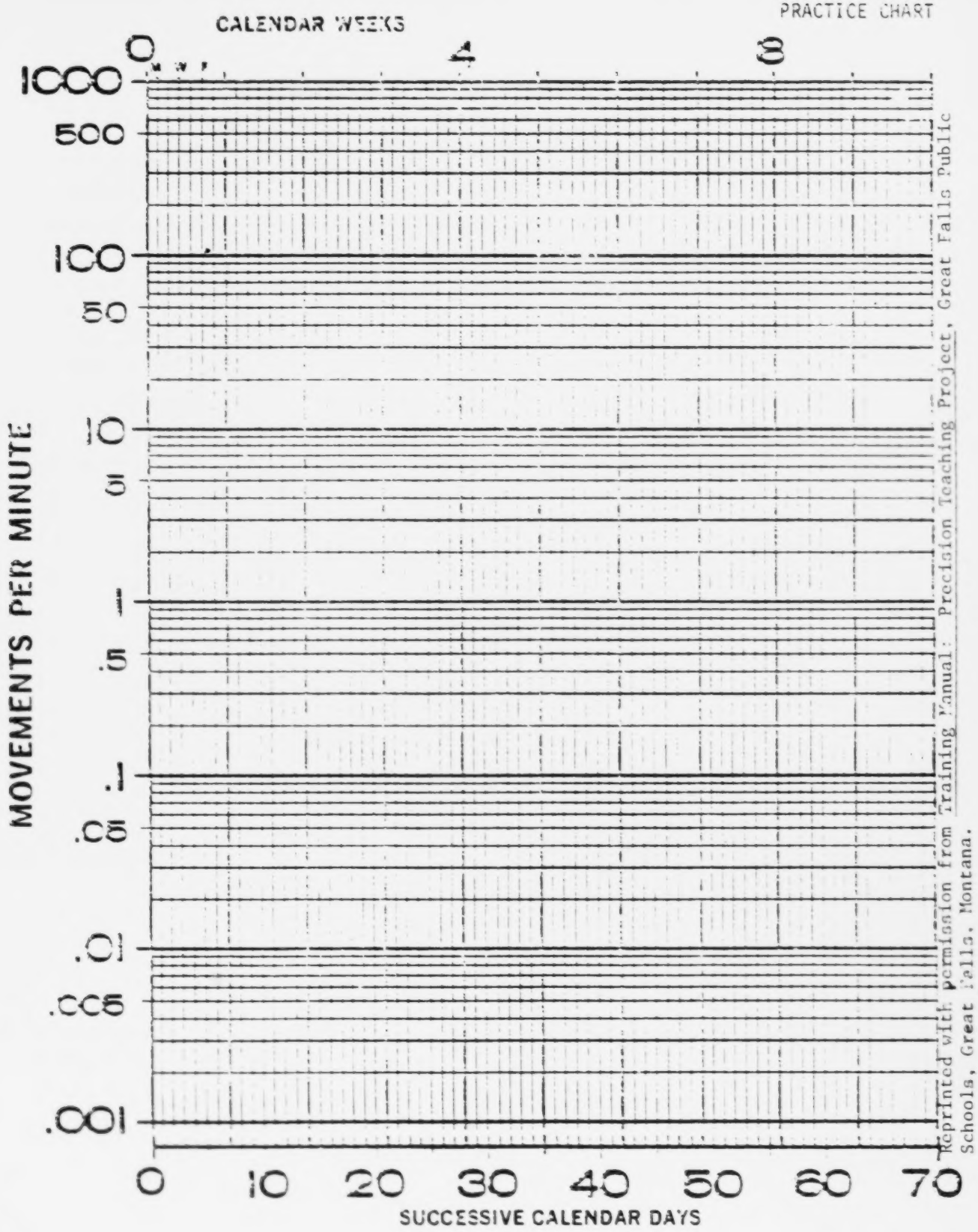


PRACTICE CHART



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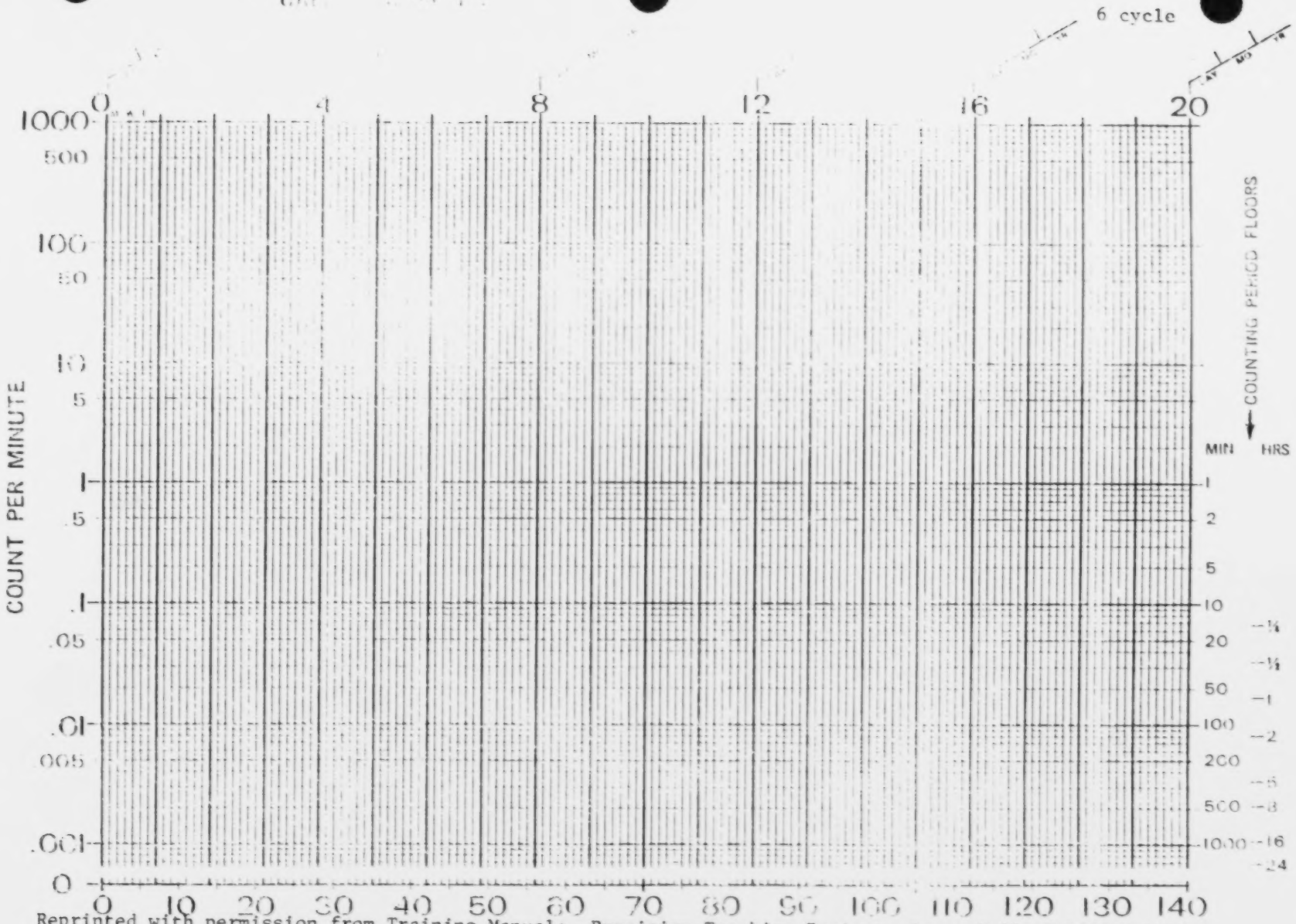
SUPERVISOR | ADVISER | MANAGER | BEHAVER | AGE | LABEL | MOVEMENT

DEPOSITOR | AGENCY | CHARTER



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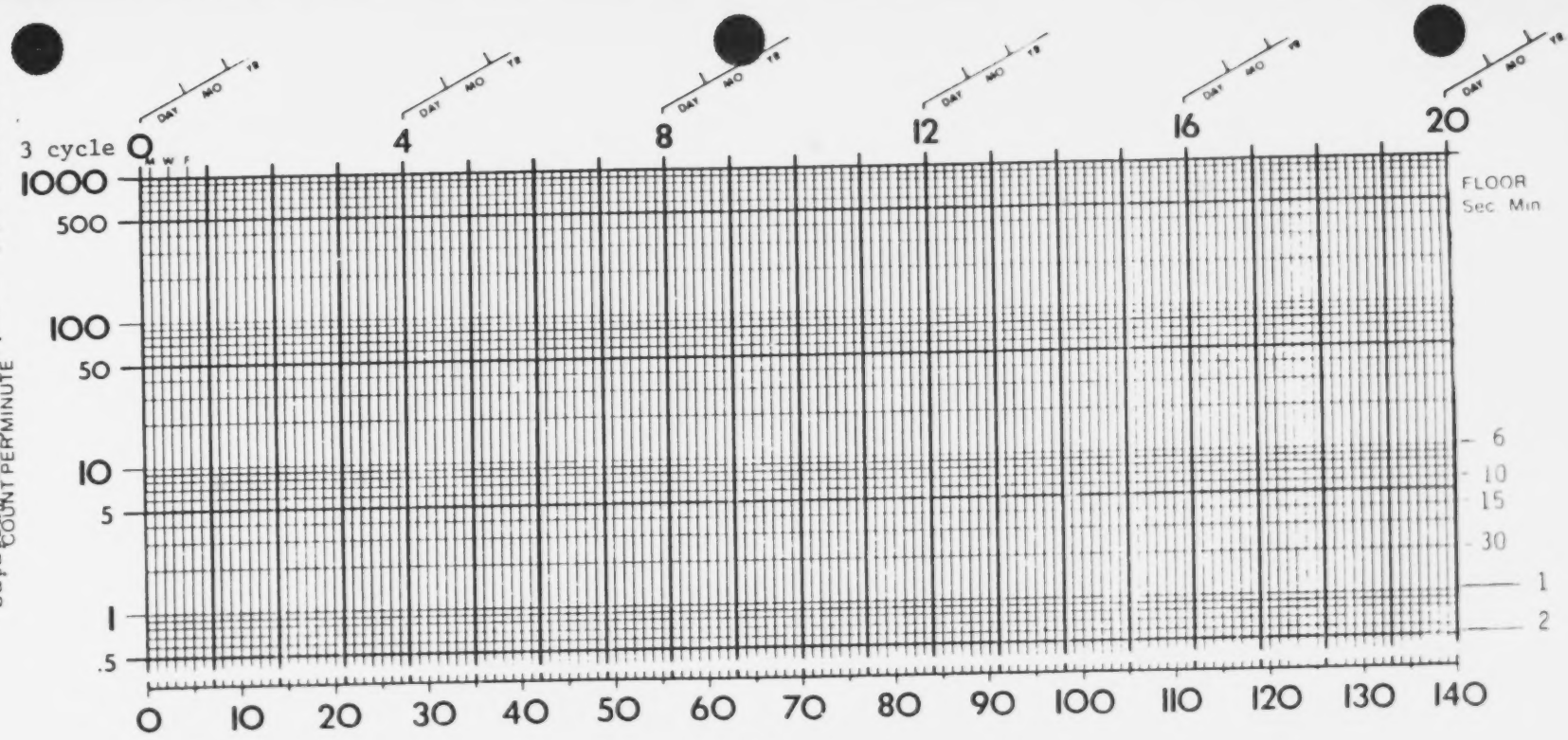
SUPERVISOR ADVISER MANAGER BEHAVIOR AGE LABEL COUNTED

135

DEPOSITOR AGENCY TIMER COUNTER CHARTER

136



	Date	M	T	W	Th	F	Date	M	T	W	Th	F	Date	M	T	W	Th	F	Date	M	T	W	Th	F
WK 1																								
WK 2																								
WK 3																								
WK 4																								
WK 5																								
WK 6																								
WK 7																								
WK 8																								
WK 9																								
WK 10																								
WK 11																								
WK 12																								
WK 13																								
WK 14																								
WK 15																								
WK 16																								
WK 17																								
WK 18																								
WK 19																								
WK 20																								

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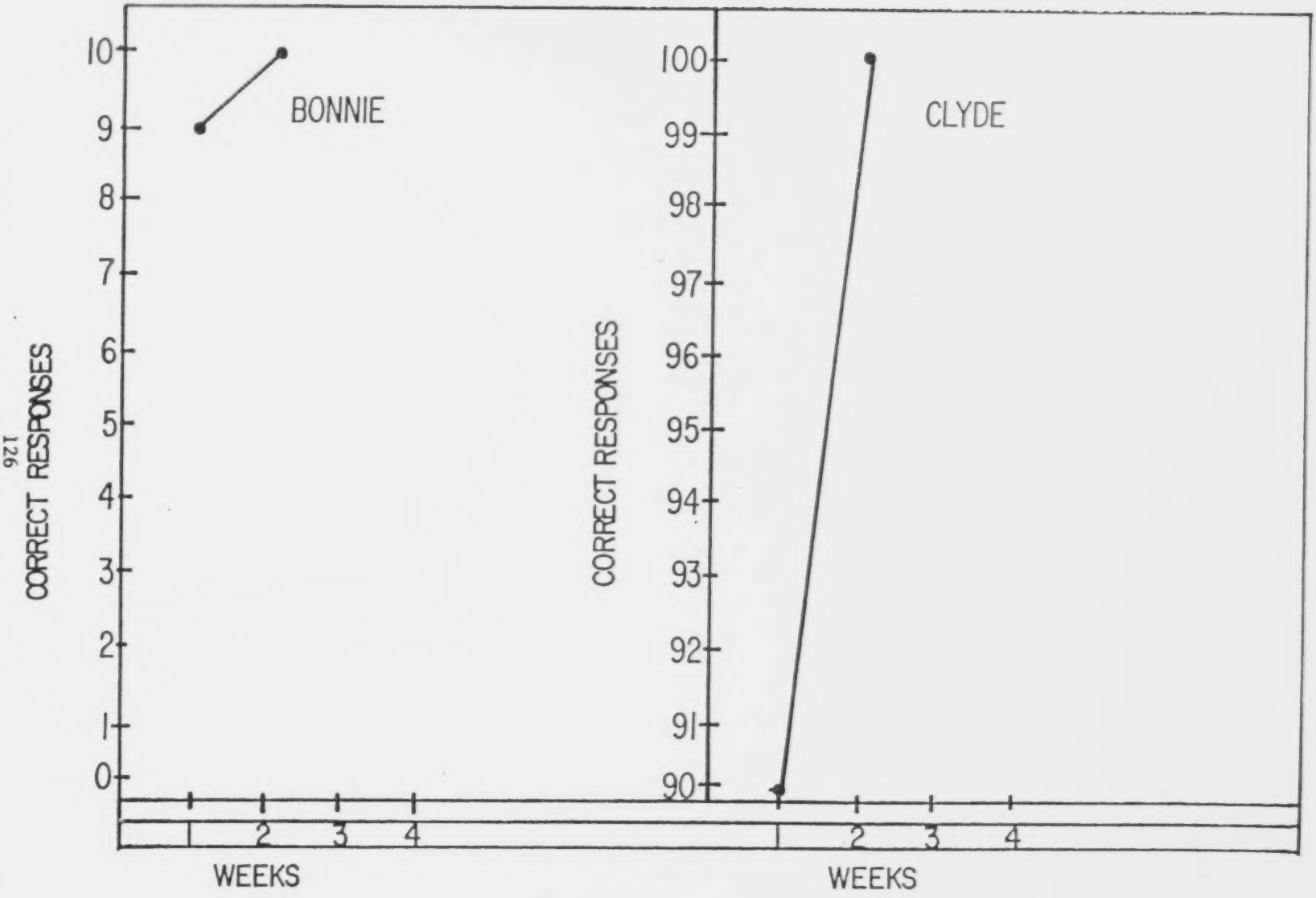
SCHOOL MANAGER BEHAVER GRADE PINPOINT


BONNIE
CLYDE
CORRECT RESPONSES
126
CORRECT RESPONSES
10
9
8
7
6
5
4
3
2
1
0
100
99
98
97
96
95
94
93
92
91
90
2
3
4
2
3
4
WEEKS
WEEKS

Sync. Dates 1985–1986

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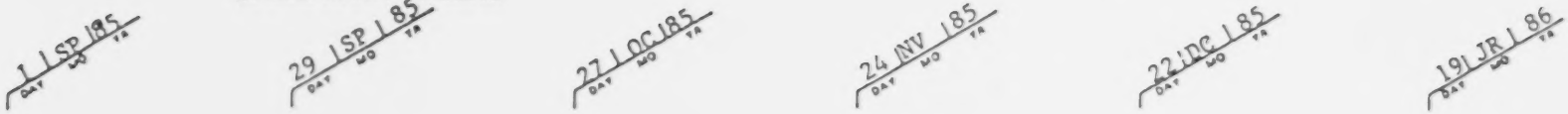
FIRST SEMESTER

CALENDAR WEEKS



SECOND SEMESTER

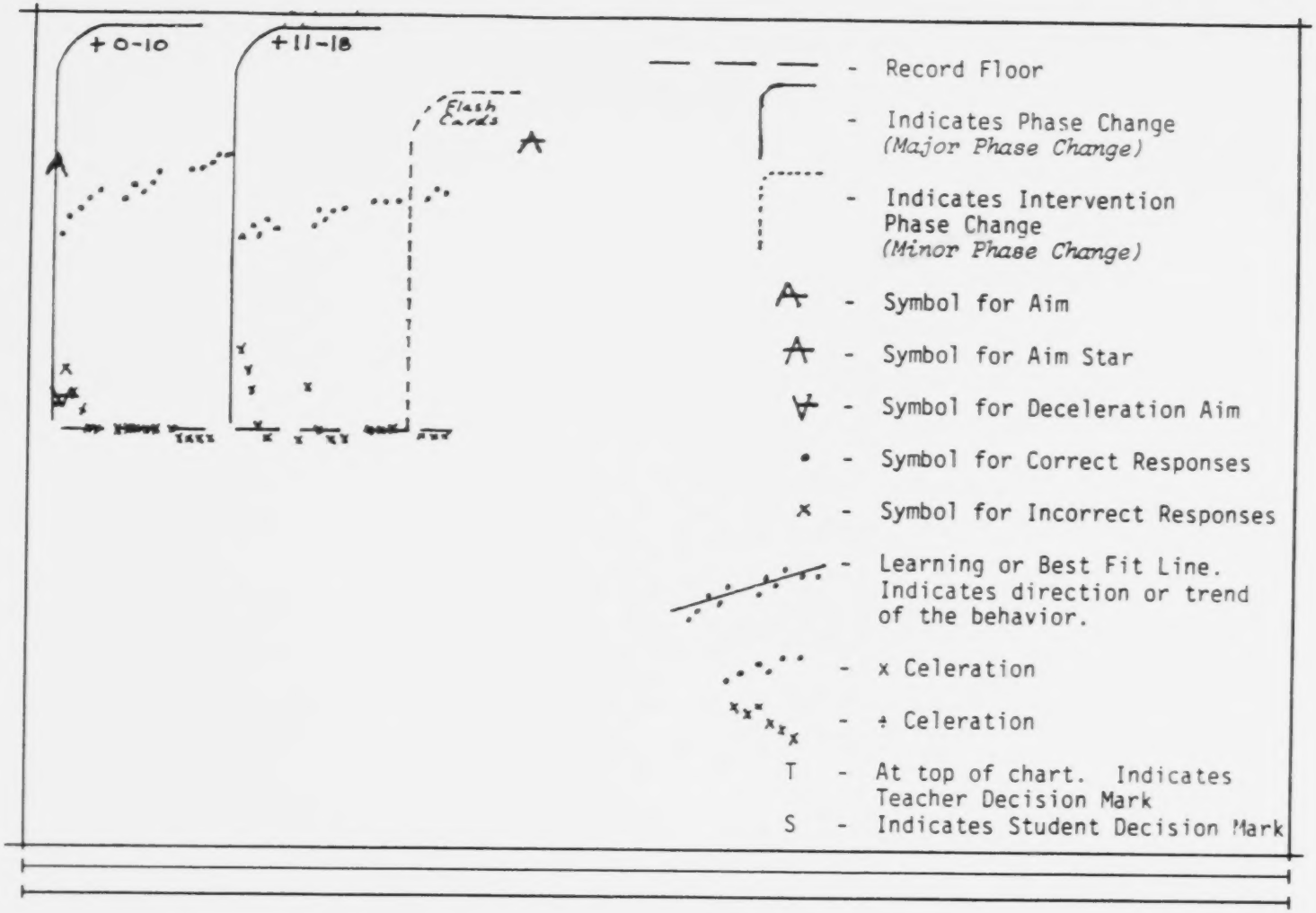
CALENDAR WEEKS

127

Sync. Dates 1989–1990

1986-87	1987-88	1988-89	1989-90
31 Ag 86	6 Sp 87	4 Sp 88	3 Sp 89
28 Sp 86	4 Oc 87	2 Oc 88	1 Oc 89
26 Oc 86	1 Nv 87	30 Oc 88	29 Oc 89
23 Nv 86	29 Nv 87	27 Nv 88	26 Nv 89
21 Dc 86	27 Dc 87	25 Dc 88	24 Dc 89
18 Jr 87	24 Jr 88	22 Jr 89	21 Jn 90
15 Fb 87	21 Fb 88	19 Fb 89	18 Fb 90
15 Mr 87	20 Mr 88	19 Mr 89	18 Mr 90
12 Ap 87	17 Ap 88	16 Ap 89	15 Ap 90
10 My 87	15 My 88	14 My 89	13 My 90
7 Jn 87	12 Jn 88	11 Jn 89	10 Jn 90

Jr - January
Fb - February
Mr - March
Ap -April
My - May
Jn - June
Jl - July
Ag - August
Sp - September
Oc - October
Nv - November
Dc - December


+0-10
+11-18
Flash Cards
- Record Floor
- Indicates Phase Change
(Major Phase Change)
- Indicates Intervention Phase Change
(Minor Phase Change)
- Symbol for Aim
- Symbol for Aim Star
- Symbol for Deceleration Aim
- Symbol for Correct Responses
- Symbol for Incorrect Responses
- Learning or Best Fit Line. Indicates direction or trend of the behavior.
- x Celeration
- ÷ Celeration
T - At top of chart. Indicates Teacher Decision Mark
S - Indicates Student Decision Mark

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Teacher

School

Child Grade Pinpoint

Teacher or Child

Charting Conventions

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MANAGEMENT

WEEK ONE: Set Up

1. Select curricular area
2. Acquire materials
3. Set up file system

WEEKS TWO AND THREE: Train/Screen

1. Train students
   a. Process
   b. Charting (see pp. 11-116)
2. Screen -- 3-day 10-day

WEEK FOUR: Decision-making

1. Pinpoint from screening & chart
2. Teach students

WHY TEACH STUDENTS TO CHART

1. THEY BECOME MORE RESPONSIBLE FOR THEIR OWN LEARNING.

2. THEY LEARN IMPORTANT CHARTING AND GRAPHING SKILLS.

3. THEY ARE MOTIVATED AND DEVELOP POSITIVE ATTITUDES.

4. THEY LEARN TO ESTIMATE.

5. THEY LEARN DAYS OF THE WEEK, MONTHS, TIME CONCEPTS.

6. THEY BUILD RATE ON FINE MOTOR SKILLS.

7. IT SAVES TIME.

SECTION 4

DECISION MAKING

This section corresponds with the video module on decision making rules or guides. Included in this section is printed material provided by the Precision Teaching Project in Great Falls, Montana. This material naturally has a precision teaching emphasis but many of the guides can be helpful with any continuous measurement effort. The primary purpose of formative data collection is to lead to relevant and timely decision making. These rules or guides are research based and can be used to significantly enhance decision making strategies.

CHART-BASED DECISION RULES

1. AT AIM FOR TWO OUT OF THREE CONSECUTIVE DAYS

---

2. THREE DAYS OF FLAT DATA

---

3. MINIMUM CELERATION OF < 1.25 FOR CORRECTS

---

4. CORRECTS DECELERATING

---

5. LESS THAN PREVIOUSLY PROJECTED CELERATION

---

6. OTHER

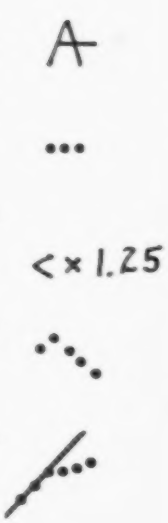

CHART BASED DECISION RULES

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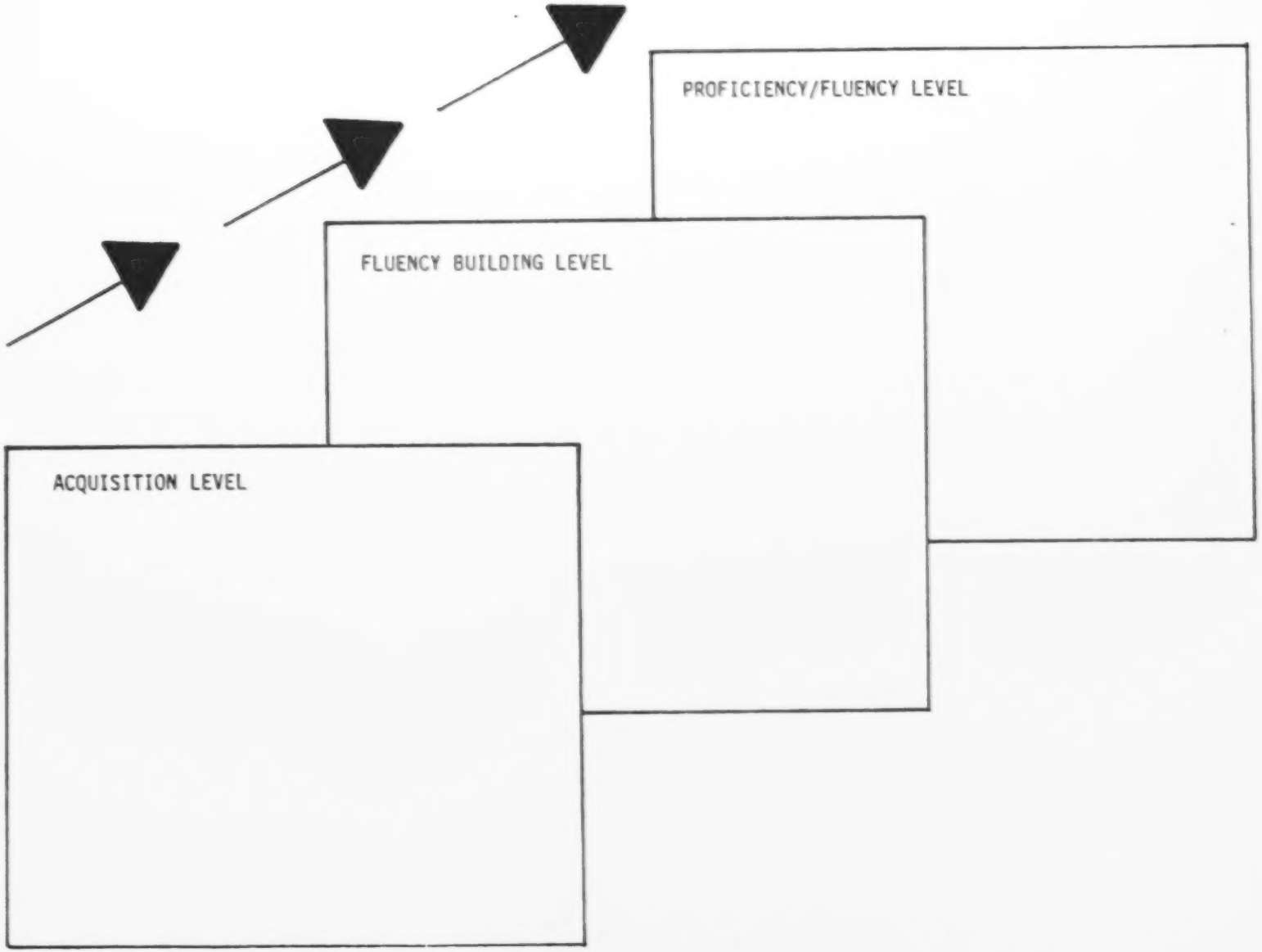

Levels of Skill Development

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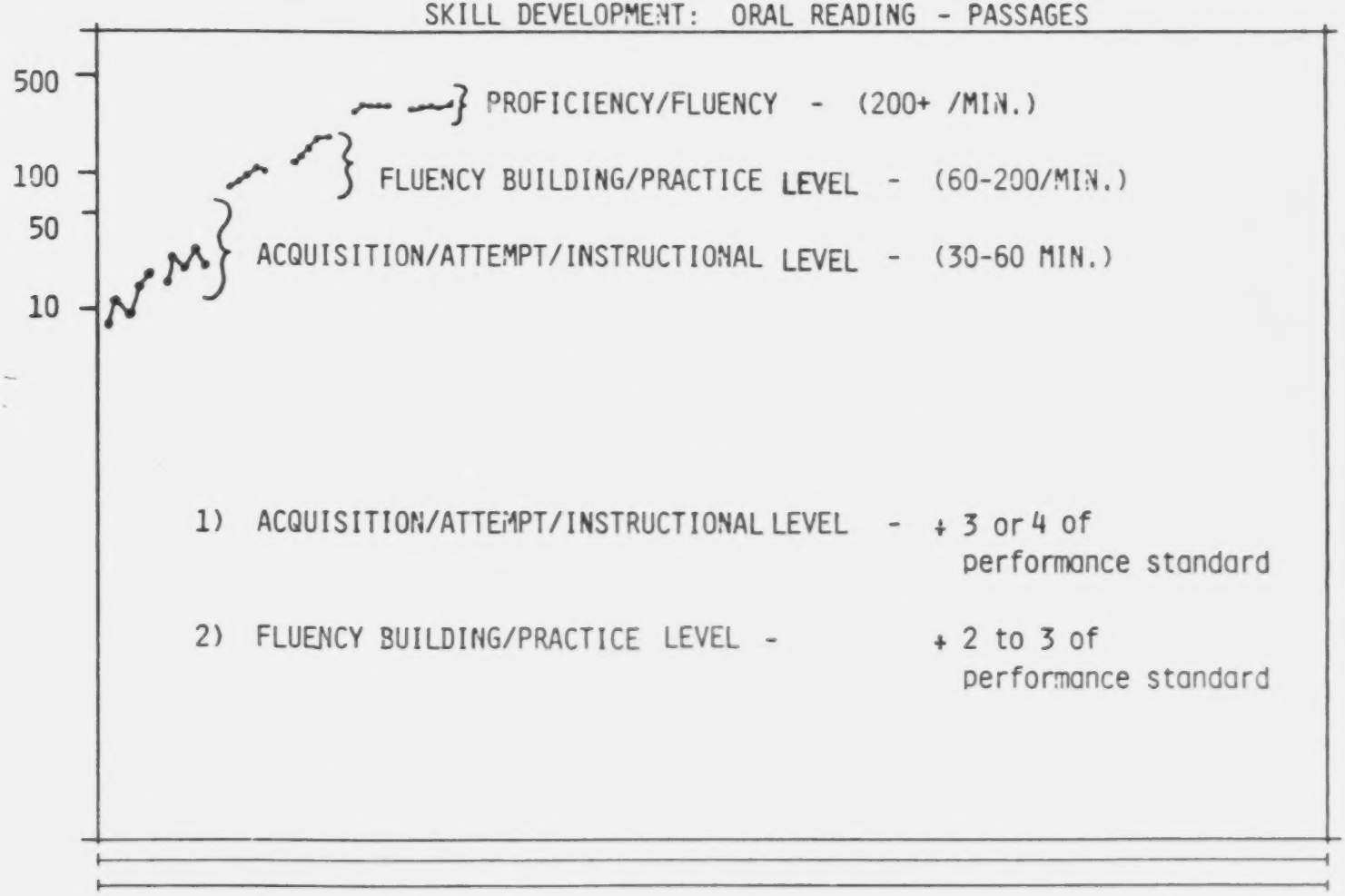
SKILL DEVELOPMENT: ORAL READING - PASSAGES
500
100
50
10
PROFICIENCY/FLUENCY - (200+ /MIN.)
FLUENCY BUILDING/PRACTICE LEVEL - (60-200/MIN.)
ACQUISITION/ATTEMPT/INSTRUCTIONAL LEVEL - (30-60 MIN.)
1) ACQUISITION/ATTEMPT/INSTRUCTIONAL LEVEL - + 3 or 4 of performance standard
2) FLUENCY BUILDING/PRACTICE LEVEL - + 2 to 3 of performance standard

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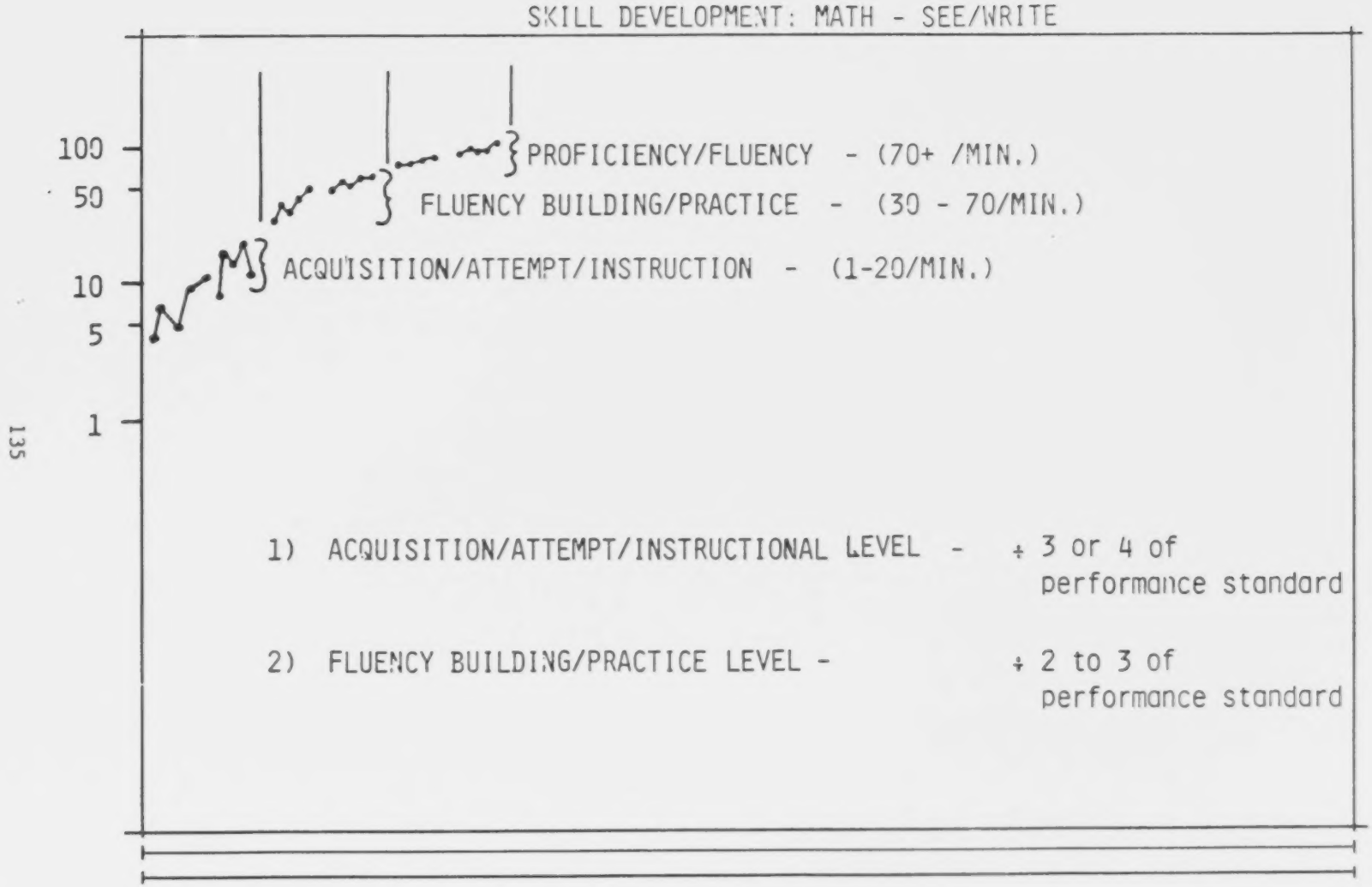
SKILL DEVELOPMENT: MATH - SEE/WRITE
100
50
10
5
1
PROFICIENCY/FLUENCY - (70+ /MIN.)
FLUENCY BUILDING/PRACTICE - (30 - 70/MIN.)
ACQUISITION/ATTEMPT/INSTRUCTION - (1-20/MIN.)
1) ACQUISITION/ATTEMPT/INSTRUCTIONAL LEVEL - ± 3 or 4 of performance standard
2) FLUENCY BUILDING/PRACTICE LEVEL - ± 2 to 3 of performance standard

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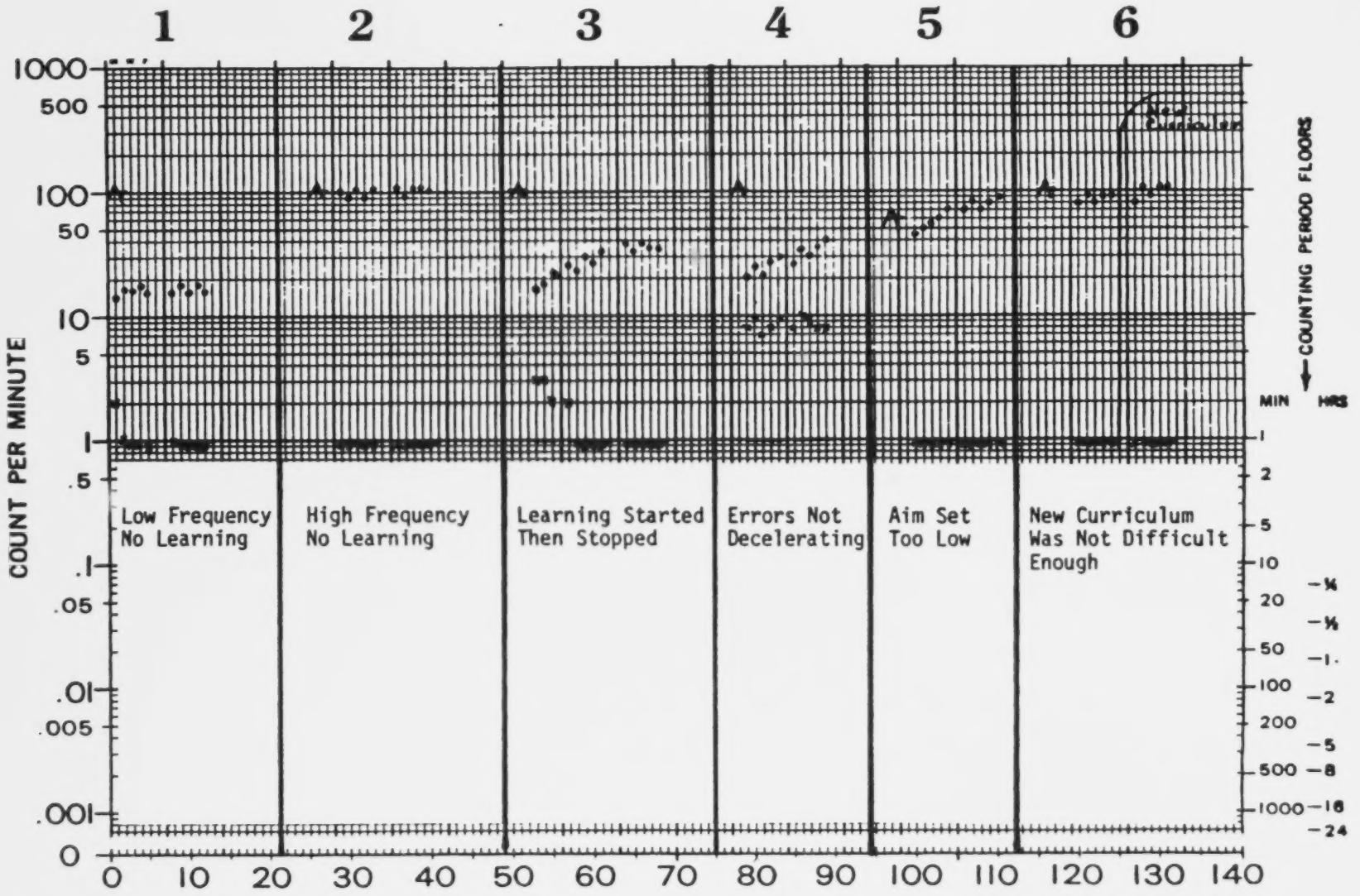

Common Patterns

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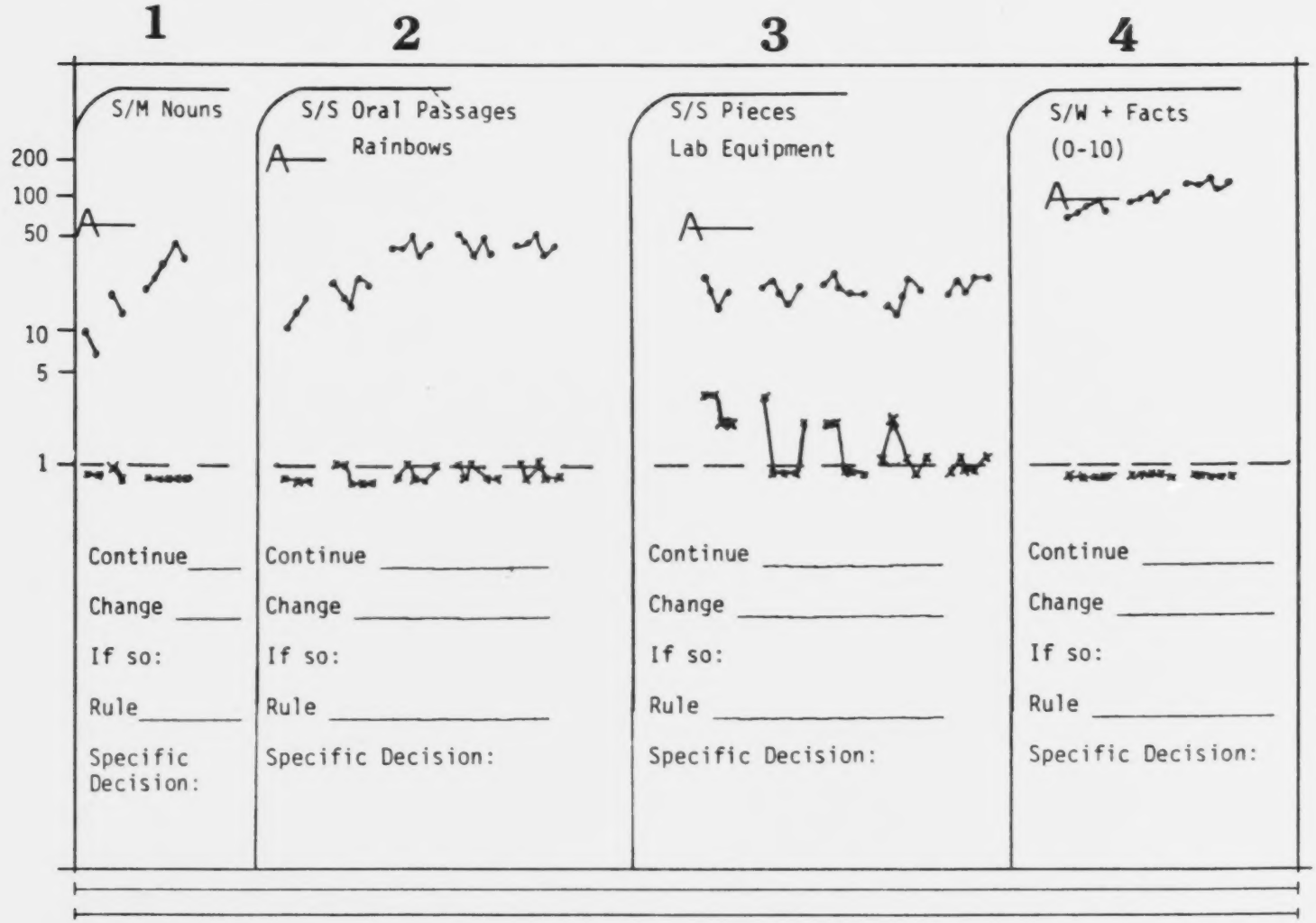
1. Examine each data picture.
2. Indicate whether to continue or change.
3. If a change is indicated, give rule number.
4. Indicate your specific decision.



Decision Practicum

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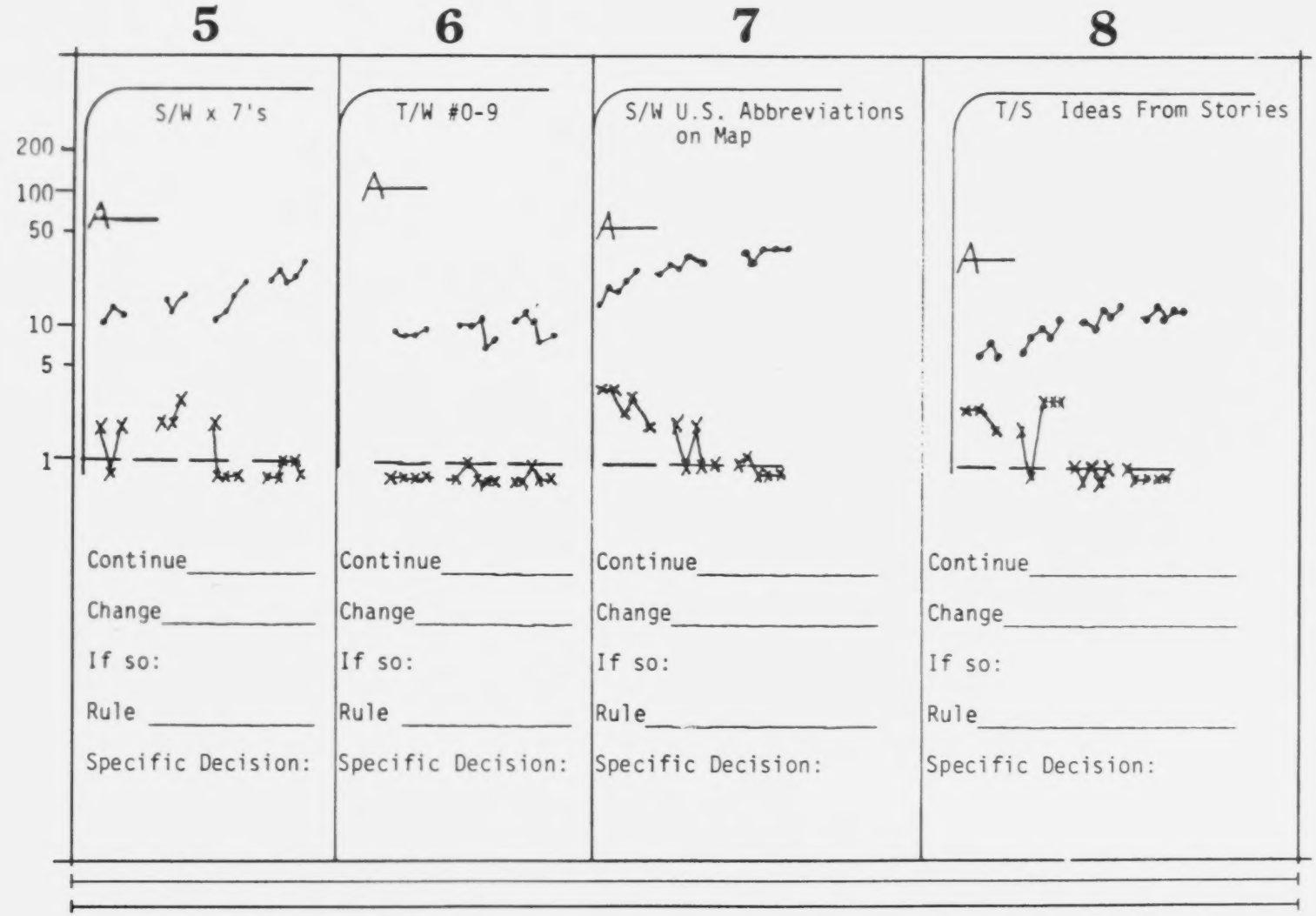
1. Examine each data picture.
2. Indicate whether to continue or change.
3. If a change is indicated, give rule number.
4. Indicate your specific decision.



Decision Practicum

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STEPS IN APPLYING DECISION RULES

Point → Record & Chart → Change → Try, Try Again

POINT

General Pinpoint - Curriculum area and specific skill must be selected.
Placement - Students must be placed within the curriculum in accord with instructional objectives.
Expectations - Specific aims must be established.

RECORD AND CHART

Time - Determine an appropriate record floor, e.g., 1 minute, 5 minutes, 10 minutes, 50 minutes.
Count - Count both corrects and errors (learning opportunities)
Chart - Chart count per minute for corrects and errors: # responses/time in minutes

- Chart on standard celeration chart.

Decision Rules

1. At aim for two out of three days
2. Three days of flat data
3. Less than x 1.25 growth per week
4. Corrects decelerating
5. Performance falling below previously project growth
6. Other

TRY AGAIN

Level of skill development, pinpoint and teaching strategy will influence the alternative chosen.

Refer to pages 39-42 for specific skill building options and to page 73 to determine level of skill development.

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PINPOINT: MATH - S/W DIGITS

IF (rule)	UNDER THESE CONDITIONS	THEN (Specific Change Options)
1. At aim for 2 out of 3 days	1. Still growing x1.25	1. Move to more difficult skill, e.g., from +0-18 to double digit addition, and consider raising aim. 2. Change general pinpoint, e.g., from addition to subtraction. 3. Allow child to continue growing on same skill until chart flattens. 4. Have child establish own aim. 5. Raise aim. 6. Change learning channel, e.g., from S/W double digit addition to S/S double digit addition. 7. Change format, e.g., from vertical to horizontal form (change 3 to 3+4=). +4 8. Do maintenance timings on skill.
	2. Flat data on chart	1. Move to a more difficult skill. 2. Change general pinpoint. 3. Do maintenance timings on skill. 4. Change learning channel.
BELOW AIM		
2. 3 days of flat data 3. <x1.25 growth 4. Corrects decelerating 5. Less than previously projected celeration	1. Student is in fluency building stage Corrects >15, but less aim	1. Error drill. - Identify errors and hesitations ..encourage skips ..cross outs or "magic number" ..partner check: observe S/W ..timing, listen to S/S warm-up ..teacher observation ..self-check with safmeds (flashcards) - Practice identified problems ..10 finger practice: S/S problem 10 times ..mini-board practice: T/W or S/copy problem 10 times on individual chalkboard or paper

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PINPOINT: MATH - S/W DIGITS
(continued)

IF (rule)	UNDER THESE CONDITIONS	THEN (Specific Change Options)
BELOW AIM 2. 3 days of flat data 3. <x1.25 growth 4. Corrects decelerating 5. Less than previously projected celeration	1. Student is in fluency building stage Correct >15, less than aim	Error drill (cont.) ..safmeds (flashcards) practice ..S/S or S/W warm-up timing on errors and hesitations ..S/copy or T/W number families, e.g., 1+3, 3+1, 4-1, 4-3 2. Paired timings. Warm-up timing (which may or may not be charted) on pinpoint slice. e.g., a warm-up timing on x7's before the charted timing on x0-9s. 3. Safmeds (flashcards) timing on all problems. 4. Multiple timings: Do the timing twice and chart the best score. 5. Warm-up timing on same skill using different learning channel. 6. Warm-up practice with answers. 7. Different channel and format practice. 8. Provide answers. 9. Pacing. 10. Use motivational strategies: See page 39 of Training Manual. 11. Slice back.
	2. Student is in acquisition stage Corrects <15 Errors may be high	1. Direct instruction. 2. Paired timings. 3. Slice back. 4. Step back to tool skill. 5. Practice.* 6. Use motivational strategies*. *May be effective if used in conjunction with "1-4".

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PINPOINT: ORAL READING PASSAGES

IF (rule)	UNDER THESE CONDITIONS		THEN (Specific Change Options)
1. At aim for two out of three days	1.	Still growing >x1.25	1. Move on to next story and consider raising aim. 2. Continue on same story until chart flattens. 3. Raise aim or have student set own aim. 4. Leap up to more difficult level. e.g., from 2nd grade to 3rd grade level. 5. Change general pinpoint. e.g., from oral reading to T/S facts. 6. Continue with maintenance timings.
	2.	Flat data on chart	1. Move to next story in sequence. 2. Leap up to more difficult level. 3. Change general pinpoint. 4. Continue with maintenance timings.
------BELOW AIM------			
2. Three days of flat data	1.	Student is in fluency building stage	1. Multiple timings. 2. Error drill: see pages 81-82 in Training Manual.
3. <x1.25 growth		Corrects >50, but less than aim Errors are low	3. Paired timings. - Warm-up of first few sentences - Warm-up on phrases or isolated new vocabulary words - Warm-up on errors made previously
4. Corrects decelerating			4. Pacing. - Guided reading - Practicing with tape
5. Less than previously projected celeration			5. Model correct phrasing and speed. 6. Use motivational strategies: see page 39 in Training Manual. 7. Slice back. - Easier passage at same grade level - Slice format. e.g. read just first sentences

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PINPOINT: ORAL READING PASSAGES
(continued)

IF (rule)	UNDER THESE CONDITIONS	THEN (Specific Change Options)
BELOW AIM		
2. Three days of flat data	2. Student is acquisition stage Corrects >50 Errors may be high	1. Provide direct instruction on skills and vocabulary. 2. Modeling. 3. Pacing. 4. Error drill. 5. Paired timings. 6. Slice back. - Easier passage - Slice format - Slice skill: chart S/S phrases or S/S isolated words 7. Step back, e.g. chart S/S isolated consonant sounds or S/S CVC words. 8. Use motivational strategies in conjunction with other interventions.
3. <x1.25 growth		
4. Corrects decelerating		
5. Less than previously projected celeration		

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PINPOINT: SILENT READING

IF (rule)	UNDER THESE CONDITIONS	THEN (Specific Change Options)
1. Reading unpracticed material orally at 200 wpm on first try	1. Corrects >200 wpm 2. Errors ≤5 wpm	1. Change pinpoint to silent reading, AND 2. Add on comprehension check, e.g. T/S or T/W facts about passage read.
1. At aim for two out of three days	1. Still growing >x1.25	1. Move on to next story and consider raising aim. 2. Continue on same story until chart flattens. 3. Raise aim or have student set own aim. 4. Leap up to more difficult level. e.g. from 2nd grade to 3rd grade level. 5. Change general pinpoint, e.g. from silent reading to T/S facts. 6. Continue with maintenance timings.
	2. Flat data on chart	1. Move to next story in sequence. 2. Leap up to more difficult level. 3. Change general pinpoint. 4. Continue with maintenance timings.
2. Three days of flat data 3. <x1.25 growth	Student is in Fluency Building Stage Corrects are >80, but less than aim	1. Identify poor silent reading habits. - Pointing at words - Mouthing words - Poor eye tracking AND

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PINPOINT: SILENT READING
(continued)

IF (rule)	UNDER THESE OPTIONS		THEN (Specific Change Options)	
4. Corrects decelerating 5. Less than previously projected celeration	1.	Student is in fluency building stage Corrects are >80, but	2.	Provide instruction. - Pacing ..manually ..use controlled reader - Phrasing ..teach student to see word clusters
	2.	Student is in acquisition stage Corrects <80	1. 2.	Paired timings. - Oral and silent reading Step back to oral reading timing.

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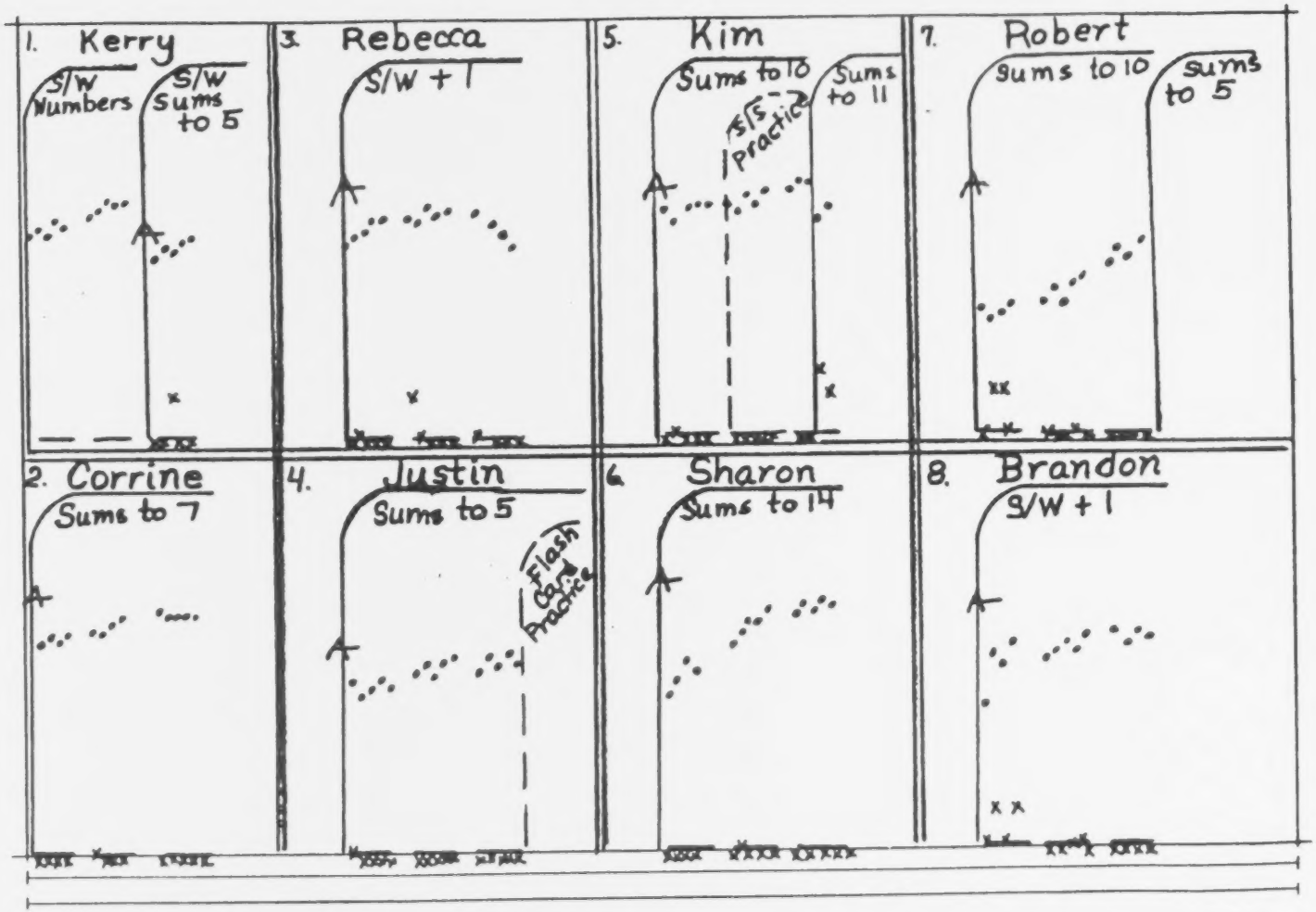

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Decision Log Practice

APPENDICES

Pages 148-218

The complete set of overhead masters which were in the Appendices were removed prior to filming as they were duplicates of the masters that appear at the end of each section.

Precision Teaching in Perspective:

An Interview with Ogden R. Lindsley

Dr. Lindsley, we've heard a great deal about precision teaching, but we would like some answers to some questions, like where did precision teaching come from?

First, let me emphasize that precision teaching came about because of children in special education classrooms. If it had not been for these students communicating their needs to their teachers and the teachers sharing ideas with us, we could not have developed precision teaching as beautifully and quickly as we did.

In 1965, here at the University of Kansas, we decided to see if collecting daily frequency records of student's performance would be useful to classroom teachers. This idea of recording frequency of performance came from learning research. Dr. B. F. Skinner was the person who developed frequency to measure behavior. But Skinner's work was based on laboratory research, and we wanted to see if recording daily frequency would be of any help in monitoring instruction and evaluating curriculum and teaching in special and regular classes.

So in 1965 we started having teachers record students' performances. Our first problem was that it was too much work for most teachers to record 2, 3, or 4 different daily frequencies on each child, especially if they had 12 to 30 students.

Then about 1968 many of our creative teachers began to involve the students in recording. We found that this was the answer to our economic and time problems -- having the students record their own behavior. Now our kindergarten and first grade children are recording and charting their daily classroom performances on Standard Behavior Charts. These records of performance are turning out to be very useful in curriculum design, behavior change, and handling discipline problems.

Is precision teaching different from or the same as behavior modification?

The thing they have in common is that the first people to use both originally were trained in the same academic discipline operant conditioning. This was developed by Fred Skinner at Harvard and Fred Keller at Columbia and some of their associates and students.

The think that makes them different is that behavior modification stresses the change procedures that were originally used in laboratory operant conditioning. It focuses on the use of extrinsic rewards or reinforcement with tokens or candy to bring about change.

Precision teaching on the other hand uses the measurement procedures that operant conditioning originally used but relies more on traditional change procedures that teachers and students invent and select. We're finding in precision teaching that the most effective ways of improving behavior, when we measure behavior frequency, tend to be curricular. They consume less classroom time and don't rely on synthetic rewards or some form of punishment to change behavior. In other words, in precision teaching we try to get the child doing more successful classroom work by making curricular changes which involve him in the learning process, rather than trying to jack up a dull curriculum with rewards for doing boring tasks.

Precision teaching involves daily recording of the frequencies of different classroom performances on a standard chart. This permits teachers and students to project the outcome of the procedures they are using. Standard charts facilitate sharing data.

Behavior modification tends to use procedures like reward and punishment in new and more controlled ways to affect instruction. The child's performance is usually measured by the teacher and does not necessarily include frequencies or the use of a standard chart. In behavior modification, measurement tends to be used to determine whether the reward system was effective or should be altered.

What implications do you think precision techniques have for exceptional children?

If we accept the fact, which most teachers do, that every child is different, then every child is exceptional. In the past we've labeled children as exceptional, or we've used specific labels like retarded or learning disabled. These children have dropped out of the bottom of a normal class. The gifted child has popped out of the top of a normal class. Gifted and learning disabled students are retarded by the curriculum assigned them in the average classroom. The gifted child is not stimulated to perform to his ultimate; the retarded child can't perform to the average.

Through individualized planning, we can give every child his own curriculum. In special education this is practically a necessity if we are to help students reach their educational goals and become functioning citizens.

Precision teaching gives the child, the parent, and the teacher a recording technique, a tool to select curriculum materials and involve the child in this selection. This makes it highly probable that you will find a curriculum that will be best for Tommy for October and one for February. If you tried two or three different curricular materials at the same time and made them as different as possible and involved the child in selecting his materials, you would probably soon find the best curriculum for him. If you try three each day and separately record his improvement on each, within 2 to 3 weeks (or in an extreme case, 4 weeks), both the child and teacher can see which of the curricula he shows the most

improvement on and which one he should stay with to gain most educationally. Once you pick the best one, then choose a new curriculum as "insurance." You may find that it is even better. In this way every child can be working on different curriculum materials at a different acceleration, and we can have a constant record for the child and teacher that shows with which set of materials the student improved the most for that month.

Another built-in advantage is that precision teaching gives an ever ready, ongoing report system to the parents. In addition, if teachers share with parents the techniques which succeed in the classroom, parents may be more willing to share home techniques with teachers.

Why is it important to chart daily frequencies of classroom behaviors? Don't children improve anyway?

There are hundreds of ways of improving a child's behavior; every child is unique and different. The problem is not to discover a new universal teaching method. I don't think one will ever be discovered. The problem is to use the excellent teaching methods we already have with the children that they will work best with.

We discovered in our original work that to benefit from Skinner's greatest discovery (the use of frequency as a measure of behavior), frequencies had to be recorded in the classroom. Then we found that we had to make a standard chart, because without guidance and structure daily charting was just too complicated and consumed too much time for most teachers. Most teachers and students made charts as unique as their personalities. When we tried to share those charts in inservice training meetings, we spent all of our time trying to figure out each others' charts.

When teachers made their own charts it took as long as 28 or 30 minutes for a teacher to make her chart clear to the other 20 or 30 teachers. The Standard Behavior Chart increases communication at least 10 times, since it only takes 2 to 3 minutes to share a project.

Also since equal percent gains get equal distance on the standard chart, you can project the future course of behavior by drawing a straight line through the middle of the daily frequencies you've charted. The direction of this line shows whether the frequency of performance is increasing, decreasing, or remaining the same.

The six cycle design of the chart provides an adequate range of behavior. Behaviors which occur once a day as well as those which occur as frequently as 1,000 times per minute can be charted. This feature of the standard chart insures that the types of behaviors teachers would tend to measure are not biased by the nature of the chart.

Once teachers learned how to chart, it was clear that teacher- and child-invented change procedures were more fun, more effective, and less expensive than many reinforcement, reward, or punishment procedures that

we might advise from a theoretical or academic point of view. It's very clear that what teachers need most is a way of comparing and evaluating the daily effects of the teaching procedures they already know, rather than advice on new ways of changing the behavior of students.

Where do you think precision teaching goes from here?

This is probably the most important question you have asked me. Around 1962 we recognized that future education desperately needed some way to handle unique differences among students. We needed some way to determine which curriculum format fitted which child best. So we set a strategy for the future. Probably one of the biggest advantages in the development of precision teaching is its future orientation.

The funny anachronism that faced us in the 1950s in human learning research was that the method which Skinner had developed to assess general laws of behavior was also the most appropriate one to study individual differences. And those studying individuals were using methods only appropriate for groups. Right now we have a similar problem where the most dynamic, and I think, the most efficient and exciting learning trends and ideas are those coming out of Piaget, Neil Summerhill, and the British Open School. However, the evaluation methods used for these new classroom ideas and theories are ones which by design can pick up only similarities and general trends among people. So a pay-off area would be to take these highly unique and different types of open classrooms and use precision teaching techniques to monitor the improvement and growth of each child, working on his own custom tailored curriculum program. A beautiful wedding would be that of the best techniques for monitoring the performance of students with the best programs for maximizing dynamic curriculum and individual learning.

Measuring the frequency of behavior was developed to record the outer behavior of people. Recently we have been charting inner behaviors like success thoughts, anxiety feelings, joy, love, and compassion. How many times a day do you feel compassionate? How many ecology thoughts did you have today? Charting may be one of the few sensitive techniques that we have to keep track of these inner thoughts, feelings, and urges. It could be that precision teaching will ultimately provide man with the most good and the most help by being applied to his inner behaviors. It is one of the few ways to chart and change inner behaviors.

Thus, some future strategies include using precision teaching to monitor students in open dynamic classrooms and letting them chart their own social interaction and self-concepts.

Another use would be to accelerate the ability of students in our regular classrooms who are getting 90 to 100 percent correct every day and are nowhere close to their educational potential. With precision teaching charts we can show that some students have been in school 4 years, received straight As, and are bored to tears. They have never shown any acceleration or improvement on their charts, which means the school has taught them nothing. They have simply performed at the top of their

class. Those students should be put on a curriculum which could allow them to make a high frequency of errors. This may sound strange because we as teachers are generally pleased when our students make few errors. The errors, however, would show that a student is challenged and working towards improvement. In addition, a special curriculum could be selected for a child gifted in math but in nothing else. Then he could stay in his regular school activities, but he could be working on college math because his charts showed that was the only math that was challenging to him.

We can use these charts on daily classroom performances and improvement to design curriculum packages. Each child could possibly have 10 curricular choices. They all could be recorded on the standard charts. No students would ever be reading the same material each week; they would change to the curriculum alternative that they showed the most improvement on.

One problem will have to be solved to make this process work. We will have to learn to treat errors as learning opportunities, as a beautiful man named Caleb Gattegno does. We want to constantly increase the difficulty of the material so that errors are present and can be used not as social stigmata but as opportunities to learn. The whole idea is to challenge the myth that children have to be right most of the time, since this idea slows down the learning process terribly. By taking the onus form errors we may find that children dare more and try more.

It is essential for creative people to be allowed to make mistakes. Most creative people I have known are different from all the people around them, for they don't know when to quit. For them every failure is a success, because they then know how not to fail that way again.

Is there anything else you would like to add?

Yes. There's a lot of confusion about precision teaching. People think it's a new teaching approach, a new type of learning or reinforcement theory. In the past most new ideas about classroom instruction have literally been "approaches" or theories involving goals. Precision teaching is not an approach; it is an easy, inexpensive system of monitoring daily improvement -- not performance, but improvement. Improvement is acceleration; performance is frequency of occurrence.

The difference is an important one, especially in view of all the talk we're hearing about raising teachers' salaries on the basis of how well the children in their classes perform. For example, if a teacher uses standard achievement tests with a group of children who are good achievers, it's not too difficult to get their performance up to criterion. The teacher can then qualify for a raise based on teaching output, measured by children's achievement test scores. The problem, however, is that if a teacher is assigned children who have great difficulty learning, the teacher would have an awful time getting the children up to criterion before the end of the semester.

You would have a very different situation if the teacher were being evaluated on the children's improvement or acceleration, that is the change or improvement in the frequency with which a particular behavior is performed. Then the teacher who had the most underachieving children would have the greatest opportunity to show pupil improvement. This kind of evaluation would directly reward a teacher for improving the behavior of children, not for trying to get them to reach some standard level of performance. In short then, precision teaching entails recording the acceleration or change in frequency of wanted behaviors or the deceleration of unwanted behaviors, as opposed to simply recording level of performance.

I'd like to again underscore that precision teacher is not an approach to classroom instruction. Any teacher who is now comfortable with her style of teaching, her hard learned way of communicating with her students, and the unique way she expresses her love for her students would not substitute precision teaching for what she is doing. She simply adds precision teaching techniques to her current style in order to become even more efficient. Precision teaching tools are designed to improve and refine current teaching methods and materials. That's a confusion I find in a lot of teachers. They fear that if they try this new thing they will have to temporarily put aside or abandon their trusted teaching skills. Precision teaching simply adds a more precise measurement instrument to present teaching, making teaching more economical, more effective, more enjoyable, and more loving.

This article has been excerpted from: Teaching Exceptional Children, Spring, 1971.

From Skinner to Precision Teaching: The Child Knows Best

Ogden R. Lindsley

Ogden R. Lindsley, the moving force behind precision teaching gave credit to the method's "ancestors" in his presentation. He traced the changes made in Skinnerian operant conditioning techniques and language as they moved from the laboratory to the classroom. Scientific terminology slowly gave way to precise common English that even first graders charting out their own behavior could easily understand. Lindsley also stressed the importance of those immediately involved in using precision teaching - exceptional children and their parents and teachers - in making this a usable and effective technique instead of a remote laboratory method. "We've got to put the most powerful things in the future of our culture together," he said, "and be very, very careful to share." The more simple and specific precision teaching becomes, the more people can share and benefit from its techniques.

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Frequency is a behavioral compare-all

The concept of rate of frequency is important to us because it is a behavior compare-all or "universal datum" in Skinner's words. You can't find a behavior which has no frequency, which means you can compare any two behaviors using frequency. We found recently that changes in frequency over weeks (celeration) are also universal and easy to get from our daily behavior chart. So acceleration is a learning or behavior change in frequency. We can compare, for example, the acceleration in dressing produced by smiling at a retarded child with the acceleration in algebra produced by a slight change in the mathematics curriculum of a gifted teenager. And we can say that the rewarding smile for the retarded child was one-half as accelerating as the curriculum change for the teenager. Thus we can numerically measure differences in improvement between children or between curricula or between school districts.

Frequency can be important to the Business Office too

It is only a small step from an objective acceleration number to compare child improvement to dividing it by the cost in dollars and we have our product statement for cost-benefit budgeting and the PPBE system. Using the same charts that children and teachers use to improve classroom teaching decisions for budget planning will save districts lots of money by getting two birds with one stone. Costly regular examinations will no longer be necessary.

So we've retained from operant conditioning the strategy of looking at frequency in multiples and the strategy of self-charting. Skinner used to say that we've got to externalize behavior and get it on the recorder. "It should be noted that at no point does the experimenter intervene for purposes of interpretation." Thus you have no observer reliability problem. Another important element of the laboratory developed techniques was to record exactly what we manipulated or reinforced. In the lab that might mean the payoff electrical circuits should go exactly to the microswitch which does the recording. That is important in classroom measurement. We should record exactly what we reward and are trying to teach.

Self-charting provides a record of inner behavior

Another detail of self-recording we've retained from Skinner is an interest in inner behaviors. He called them "private events" and said their functions and laws were no different from those for outer behavior. He hadn't studied inner behaviors, he said, because he hadn't yet discovered a way to record them. People, however, as opposed to rats and pigeons, can record their own inner behaviors much the same way they record their own outer behaviors. Continuous and complete monitoring is very important for both. United Airlines has computers continually tape recording characteristics of their planes in flight. They call this "predictive maintenance." When a carburetor--or a child--is heading for trouble, continuous monitoring gives early warning. Continuous monitoring of behavior frequency was the rule in laboratory operant conditioning. Description rather than explanation was the strategy.

Continuous and complete monitoring gives early warning

Functional definitions: e.g. the "punishing reward"

This leads us to descriptive or functional definitions, one of Skinner's major conceptual contributions. For example, Skinner functionally defined reinforcement. By putting an adjective describing the effect before the noun describing the procedure you can easily separate function from procedure in basic English. This is the easiest way to share this important distinction with children, parents, and teachers. You can have effective signals or ineffective signals, accelerating signals and decelerating signals, frequency multiplying arrangements, and celeration multiplying curricula. And you can also have rewarding rewards, ineffective rewards, or punishing rewards. If you attempt to reward and the behavior decreases, like it or not, you have a punishing reward (Figure 1).

INSERT FIGURE 1

Using our language more precisely, we separate what we did from what we had planned to do. We can distinguish our results from our hopes and thus reduce confusion in sharing our classroom experiences.

BEHAVIOR BUILDING

We have also retained behavior building. Almost all of early operant conditioning involved demonstrations. In the early fifties we compelled attention by demonstrations of exceptional skill in producing dramatic and unusual behavior. We synthesized behavior in making pigeons play ping-pong. We did not analyze behavior into its parts, or succeed in finding what part of a rat was most important to its figuring out how to run through a maze. We produced behavior; we did not analyze it.

It was skill in producing behavior that convinced the pioneers. What made me an early operant conditioner was that only one month after learning the method, I was able to learn from Samson Rat how to teach him to lift over 250 percent of his own body weight in only four days of training. Skinner knew this and used to say, "The animals make operant conditioners; I don't."

The behavior goes at his own frequency and celeration ...

We should also remember that in free operant conditioning the behavior is free to behave at any moment. There are no trials (as there are in controlled operant conditioning), just learning or class periods. The pigeon in his chamber or the child in her classroom can go as fast and as far as their abilities permit--all limits are theirs alone.

...and has personalized procedures

Another important point which is often overlooked is personalized procedures. Skinner and I, he a full professor and I his graduate student, once spent a whole Saturday hunting for a special kind of millet for a pigeon that wasn't performing at as high a frequency as other pigeons. Our searching for millet to fit this particular pigeon--RGY-32--was like the School Superintendent and a student teacher driving 200 miles on a weekend to find a unique curriculum for kooky Tommy. And I think this is the most important element to retain...different strokes for different folks!

SOME LAB TECHNIQUES ABANDONED

There are certain elements of laboratory operant conditioning we had to prune away to develop precision teaching. We had to abandon the isolated environment of the laboratory. As I said before, this was Bijou's and Ayllon's and Haughton's contribution, to bring us lawful data from classrooms and wards.

Secondly we had to abandon deprivation. Although technically feasible, it is immoral to teach children by placing them in closets and depriving them of lunch, when rearranging their curricula would be as effective and less costly.

Extrinsic rewards relegated to emergency procedures only

Also, we had to abandon synthetic or extrinsic consequences, except in emergencies, as too costly and unnecessary. Occasionally extrinsic rewards backfired and produced deceleration--actually being punishing rewards as shown with the M&M candy in Figure 1.

And again in the classroom improvement project shown in Figure 2, we see that "the child knows best." I, as supervisor, and Mike Dixon, the advisor, suggested a piece of M&M candy as a reward for each numeral said correctly by Rodney, a 6 year old boy bearing the label "emotionally disturbed." Under this "reward" his correct frequency divided by 1.5 each week—deceleration! A punishing reward!

INSERT FIGURE 2

The next person to try a helping procedure was his teacher, who suggested a star for each numeral said correctly. At first, the use of stars multipled his frequency by 2, but as the week of stars went on, that frequency divided by 1.5. Rodney worked twice as fast, but he was losing interest at the same deceleration!

As is so often tragically the case, the last to be asked for suggestions was the behaver, Rodney. With a gleam in his, Rodney said, "What I would like best is when I finish my lesson, you talk to me a

bit." This multiplied his frequency of numerals said correctly by 3.0 and his celeration or growth by 2.0!

Stop using consequences which are not part of the classroom; get suggestions from the children

After many experiences like this it became clear that if we were to remain scientists we must stop advising teachers to use consequences which are not part of the classroom, and urge our teachers to get suggestions from their children. With our charts to guide us we have no fear; the data tell us when we are going in the wrong--or right--direction.

We also had to abandon mechanical recording. In 1965, in Shawnee Mission, Kansas, we surveyed a group of teachers to find out what classroom behavior they wanted us to work on most. Immediately, you see, we had ruled out the children. The teachers were most bothered, they said, by talkouts and secondly by children jumping out of their seats. Harold Kunzelmann developed an automatic recorder to screw on the bottom of the seats to record the number of times weight came off the chair. To get baseline data, teachers started counting and charting out-of-seats before the boxes were installed. The problem was that many of the teachers got rid of the out-of-seat behavior before Harold could get out to their classrooms with his recorders. So there were two alternatives: to hold up teachers while he screwed on gadgets and published on behaviors that could be mechanically recorded or to become classroom teacher oriented and work with teachers and their skills and needs. So out went mechanical recording.

SIMPLIFYING THE LANGUAGE

Laboratory jargon just had to go

The next thing that had to go was laboratory jargon. The language of operant conditioning is confusing and difficult. It is not precise. And for self-charting, we needed terms in basic English so that second and third graders would know what we were talking about.

Are decelerating consequences not punishers but really helpers?

Our first signal that we should pay attention to "the child knows best" happened in a classroom. We had a chart of thumb-sucks by a 12 year old boy labeled "emotionally disturbed." He was tallying his own thumbsucking; but in 1966 we didn't realize how important self-recording was, so we didn't make much of it. The thumb-sucks were accelerating on the chart before any changes were made to improve the situation. Since it was worsening, Martin Bisaha, the teacher, said "Why don't you use this to decelerate your thumbsucking?" And the little boy took the role of scotch tape from Martin's hand and put a piece over his well sucked thumb. The chart showed a rapid deceleration of thumbsucking produced by the self-applied tape. One day Martin forgot to put out the tape roll and the boy came to him and said, "May I have my little helper?"

When Martin told me this in a teacher training class a few nights later, I thought, Wow! If the child knows best what it means to him, we can't call it a punisher. It's a helper, a reminder. It's not a hurter, not a punisher. That was one of the very first clues we got that we should change some of our words and look more closely, more precisely at what people say about their own behavior.

Look more closely at what people say about their own behavior

This going from our beloved laboratory jargon to precise common English was very difficult and took years. The process is still going on. I think it is so hard because it involves changing our own thought processes--how we have been taught, at great expense, to perceive things. Here are some other examples of the changes we made.

We gave up "rate" in favor of "frequency" because people thought we meant quality (rating sheet) or value (first rate) or speed (which is distance over time). Frequency is much less misunderstood. Also, some teachers, when they heard the word rate, felt all we were trying to do was increase reading speed instead of both accuracy and comprehension.

When we referred to "steep and shallow slopes" of the frequency on our standard chart, many thought it had something to do with skiing. Also, we had trouble separating "up-slopes" from down-slopes." Now we talk of "acceleration" and "deceleration" which are more easily connected with changes in frequency by most of us.

Some people though logarithms were dancing logs!

Discussing a logarithmic scale scared many and confused the rest, so we went to "ration scale" which only helped a portion of us. We've recently found that the best word for elementary teachers and children is "multiply-divide" scale (Figure 3). As you go up the left of the chart by equal distances, you multiply the numbers by equal amounts of factors. If you come down by equal jumps, you are dividing by equal amounts at each jump. This seems to tie in better with people's ordinary vocabulary and the elementary math curriculum.

INSERT FIGURE 3

We began describing the parts of the chart by formal mathematics... and had a lot of trouble teaching it

We began by describing the parts of the chart by the method we had last learned--formal mathematics. Thus what went up the left we called the ordinate and what went across the bottom was the abscissa. And we had a lot of trouble teaching the chart. Then two years ago, we heard Stephanie Bates, a 5 year old kindergartener teaching the chart to others in her class, say, "See the dark blue lines that go up and down. They are Sunday lines. All the lines that go up and down are day lines." She was

telling what you see and what you do on the chart. You put a dot where the Sunday line crosses the one-per-minute line if you did something once in a minute on Sunday.

We were brought back to precise basics by our children and teachers

We had been remembering our plane geometry and not paying attention to what we did on the chart. In exactly this way we abandoned the abstractions we had learned and were brought back to precise basics by our children and teachers.

We went from "operant level," which was our old laboratory word for what the behavior frequency was before you rewarded it, to "base-line" and finally to the simple "before." A similar simplification trip was from "experimental conditions" or "independent variable" to "intervention" to "during," as in during SRA level 2.5 or during five minutes of listening to language tapes for each 10 math problems correct. "Extinction," which described taking out the procedure to see if the effect was durable and confusingly also described the disappearance of the effect if it was not durable, became merely "after."

What is really new in our system is precision

There was even difficulty with the name of our whole system. In the Midwest, the most common response to the words "free-operant conditioning' was that it was a way of waterproofing shoes. We didn't want to have to unteach shoe waterproofing so we went to "behavior modification." Many parents said that didn't say anything. They thought we were saying, "We are going to modify your child's behavior by behavior modification." That meant nothing to them. Thinking that what was really new in our procedure was precision, we decided to use that as an adjective in front of whatever it was one was doing: Hence, in our case, "precision teaching."

"Subject" was our first word for the person whose behavior was being charted or improved. Its most common meaning is "one who is placed under the authority. dominion, control, or influence of something else. One who is bound in servitude to a feudal superior; a vassal." Since we didn't want to vassalize children, that had to go. So for several years we used the term "protege" for the person whose behavior was being charted and improved. In an inservice workshop in Hibbing, Minnesota, a lovely teacher told me at the coffee break, "Dr. Lindsley, that word protege is too high-brow, it just has to go! Find a word that has something to do with behavior." So I got the courage to search again, and it was like a breath of fresh air when we discovered the word "behaver."

We now have enough hard science to be secure enough to talk like people again

We have to discard the word "reinforcer" along the way. This also hurt because the word was introduced to the academic community by my dearly beloved teacher, B. F. Skinner; and was one of our old hallmarks. Regretably though. to most practitioners the most common meaning was

"bridge abutment." In the plural it produced "military troops" as the most common understanding. Awkwardly we played around with "accelerating consequence" for awhile, but it is hard to say and harder to teach. I think that now, with our charts and 12,000 behavior improvement projects stored in the Behavior Bank's computers, we have enough hard science to be secure enough to talk like people again. We can start using basic English precisely with functional adjectives like effective reward, untried consequence, punishing reward, and rewarding punishment.

The term "pinpoint" was suggested by Ed Sabastian, one of the fathers in our first parents' class in 1965. The class was rapidly being turned off by my scientific jargon. Pinpoints are things you have selected to count in behavior improvement projects. As Ed said, "You pinpoint a behavior of action." And the things you use to change behavior we now call simply "procedures" or "changes."

"Experimentally analyze" was a term dear to my heart, for I had been a victor in the academic war that introduced the term to professionals. But our teachers didn't want to experiment and they don't like to analyze. And to make matters worse, the things we called experimental analyses (note the difficult plural spelling) were neither true experiments nor analyses in the strict laboratory sense. In laboratories you pay thousands for the controls required for true experiment and analysis.

Grandmother Lindsley's law: Try, try again

So we talked about "pragmatically selecting" things for a brief while and soon translated that into my grandmother's law: "Try, try again." As Grandmother Lindsley used to say, "Ogden, you will not at first succeed, so you just try, and try again." Figure 1 shows two of these tries: the M&M's and the marks on the child's hand. Figure 2 shows three tries: the M&M's, the stars, and the talk at the end of the lesson.

To cover briefly a few more changes in terminology. we went from "private events" to "mental events" to "inner behavior," and from "public events" to "physical behavior" to "outer behavior." From "self-control," which implies a false duality, we went to "personal management."

Figure 1. The Punishing Reward: M&Ms Decelerate Desired Behavior

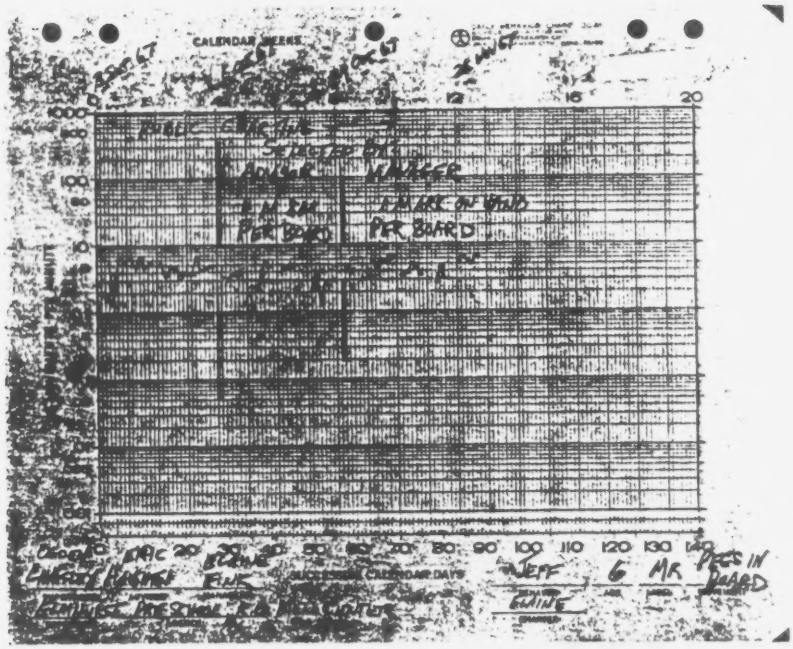
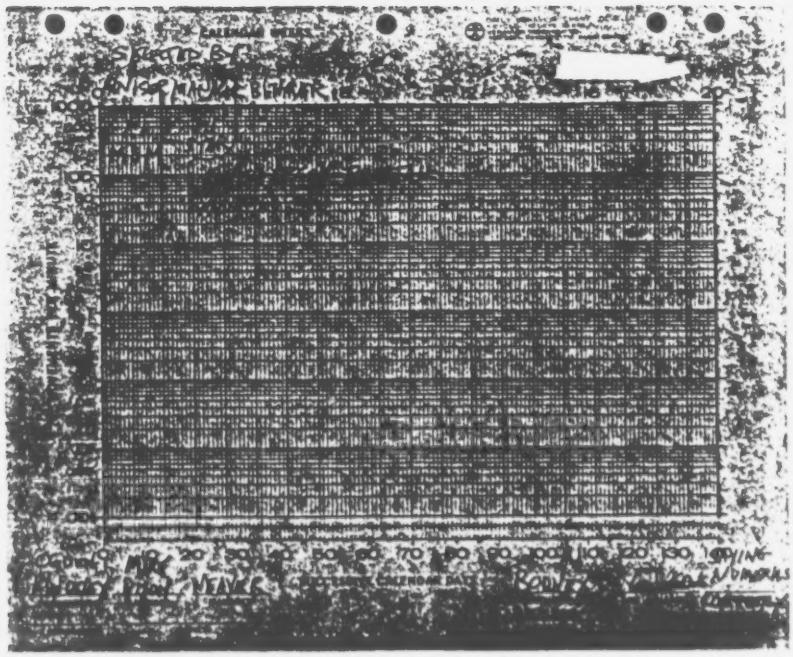


Figure 2. The Behaver Chooses His Own Reward



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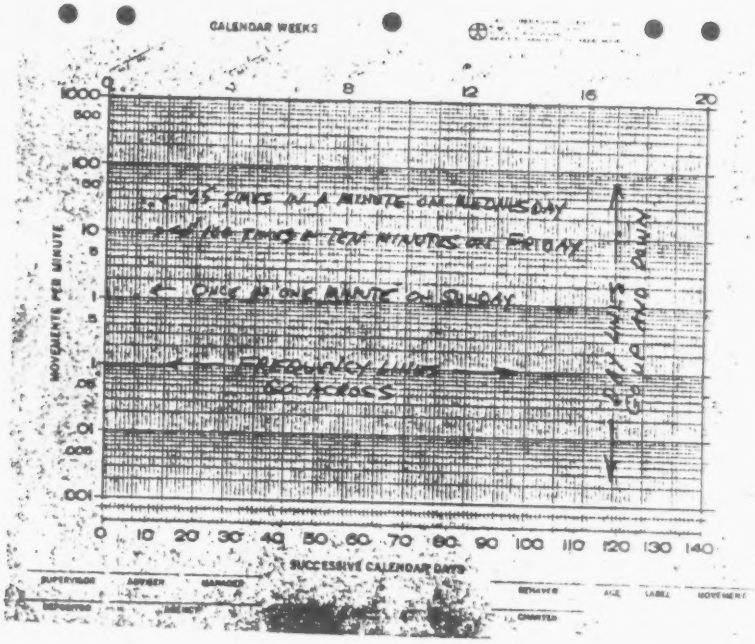
Figure 3. The Multiply Divide Scale Simplifies Reading the Behavior Chart